VI3 Networking: Advanced Troubleshooting

ESX Networking Architecture

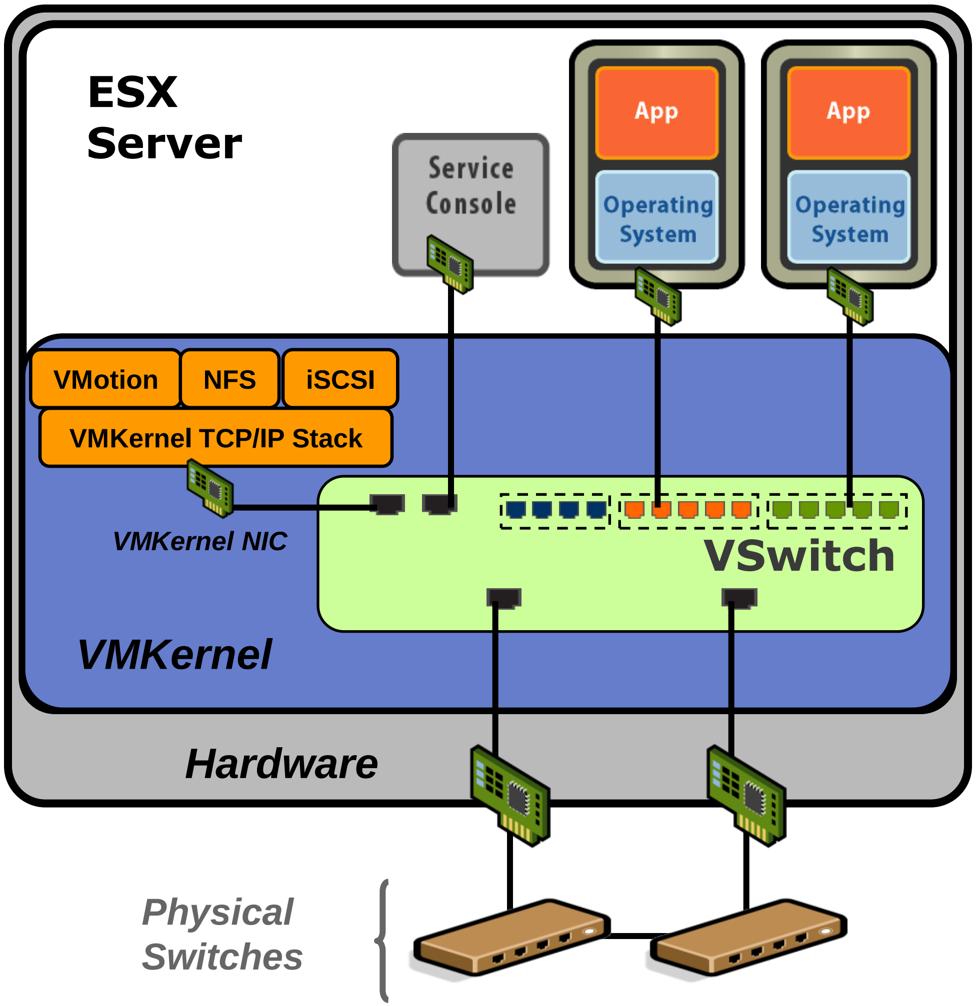
Physical NICs

Virtual Switch

Virtual NICs

- VM's Virtual NIC
  - Flexible
  - Enhanced
  - Virtual E1000
- Vswif for the Service Console
- VMkernel uses vmknic

VMkernel TCP/IP Stack



Agenda

Basic Troubleshooting

- How to isolate problems?
- What tools are available for troubleshooting?

Troubleshooting Scenarios

- Step-by-step guide on how to troubleshoot some specific networking problems

Basic Troubleshooting Techniques

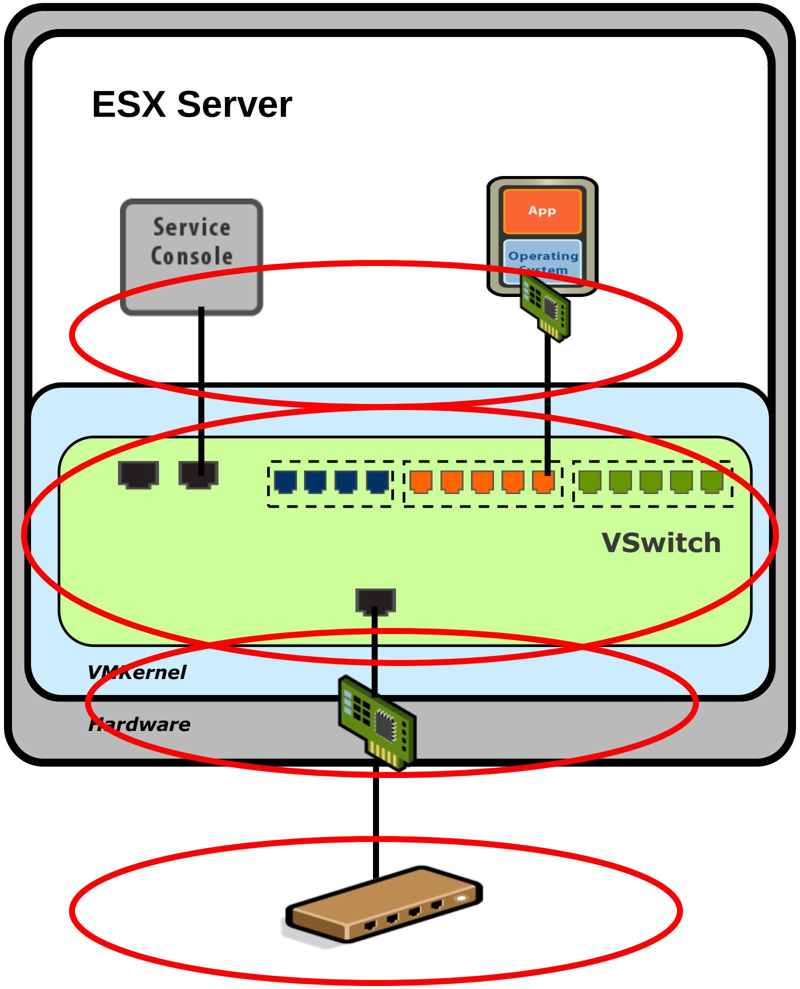
Isolate the problem

Troubleshoot one component at a time

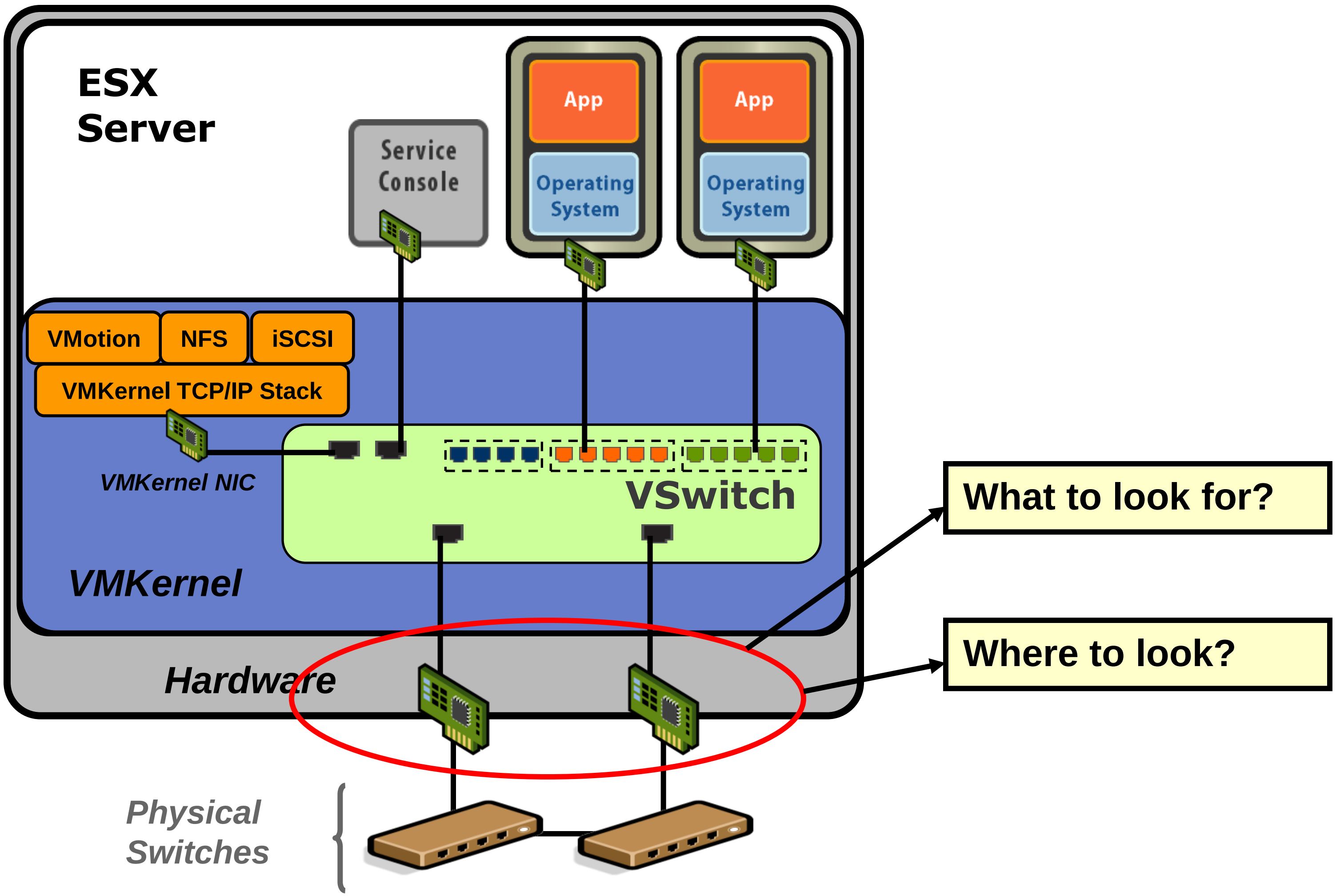
- Physical NICs
- Virtual Switch
- Virtual NICs
- Physical Network

Tools for troubleshooting

- VI
- Command Line Utilities
- Third party tools
  - Ping and traceroute
  - Traffic sniffers and Protocol Analyzers
    - Wireshark
- Logs



Isolating Network Problems: Physical NICs



Physical NICs: What to look for?

Does the device show up?

- Is the driver loaded?

Physical properties of the link

- Link State
- Link Speed
- Duplex Setting
- MTU settings

→ **esxcfg-nics**, **ifconfig inside Service Console**, **VI Client**

Is the NIC connected to where you want it to be connected?

→ **Network Hints**, **Cisco Discovery Protocol (CDP)**

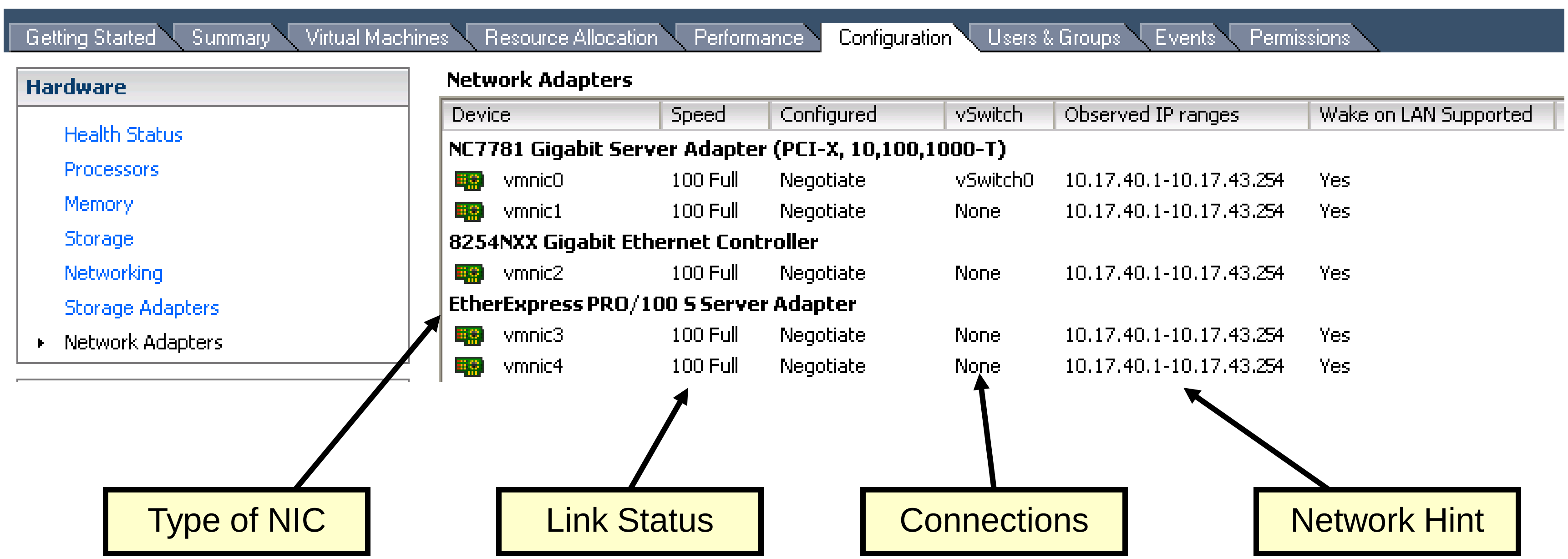
Is the NIC working?

- Is the NIC transmitting and receiving packets?
- Is the NIC dropping any packets?

→ **ifconfig inside Service Console**, **esxtop/resxtop**, **esxcfg-info**

Getting information about the physical NICs

VI Client provides basic information about the physical NICs



Getting information about the physical NICs

esxcfg-nics allows you to set or get physical NIC settings via the command line

```
[root@osdc-sust005 root]# esxcfg-nics
esxcfg-nics <options> [nic]
   -s|--speed <speed>        Set the speed of this NIC to one of 10/100/1000/10000.
                             Requires a NIC parameter.
   -d|--duplex <duplex>      Set the duplex of this NIC to one of 'full' or 'half'.
                             Requires a NIC parameter.
   -a|--auto                 Set speed and duplexity automatically.  Requires a NIC parameter.
   -l|--list                 Print the list of NICs and their settings.
   -r|--restore              Restore the nics configured speed/duplex settings (INTERNAL ONLY)
   -h|--help                 Display this message.
```

Getting information about the physical NICs

The '- l' option lists the nics in the system and their settings

- Link State
- Speed
- Duplex
- MTU

```
[root@osdc-sust005 root]# esxcfg-nics -l vmnic1
Name    PCI      Driver      Link Speed    Duplex MTU    Description
vmnic1  01:05.00 tg3         Up   100Mbps  Full   1500   Broadcom Corporation NC7781 Gigabit Server Adapter (PCI-X, 10,100,1000-T)
vmnic2  07:02.00 e1000       Down 0Mbps    Half   1500   Intel Corporation 8254NXX Gigabit Ethernet Controller
vmnic4  0b:02.00 e100        Up   100Mbps  Full   1500   Intel Corporation EtherExpress PRO/100 S Server Adapter
vmnic3  0b:01.00 e100        Up   100Mbps  Full   1500   Intel Corporation EtherExpress PRO/100 S Server Adapter
vmnic0  01:04.00 tg3         Up   100Mbps  Full   1500   Broadcom Corporation NC7781 Gigabit Server Adapter (PCI-X, 10,100,1000-T)
[root@osdc-sust005 root]#
```

Where is the physical NIC connected to?

Just follow the cable

OR

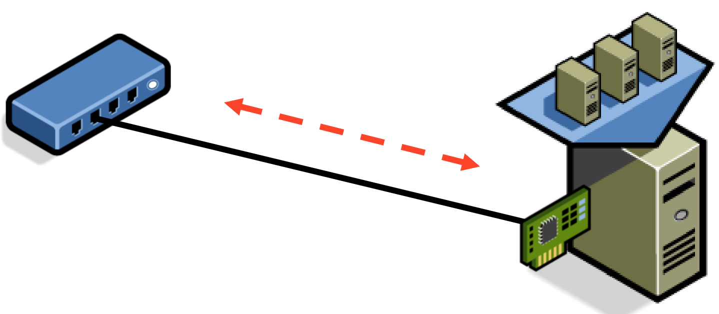
Use CDP and Network Hints



Cisco Discovery Protocol

Periodic exchange of information

- Physical switch port a vmnic is connected to
- vSwitch a physical switch port is connected to
- Duplex and speed settings



Cisco Discovery Protocol

Properties	
Version	0
Timeout	0
Time to live	141
Samples	11290
Device Id	cs-eth-netcore1.csl.vmwar
Address	172.17.1.3
Port Id	GigabitEthernet0/23
Software Version	Cisco IOS Software, C3560
Hardware Platform	cisco WS-C3560G-24TS
IP Prefix	0.0.0.0
IP Prefix Length	0
VLAN	1
Full Duplex	true
MTU	0
System Name	
System OId	
Management Address	172.17.1.3
Location	
CDP Device Capability	
Router	false
Transparent Bridge	false
Source Route Bridge	false
Network Switch	true
Host	false
IGMP Enabled	true
Repeater	false

Cisco Discovery Protocol

CDP is enabled by default in listening mode

On ESX Server 3.5, it is possible to configure CDP also in advertising mode

- Enabled/disabled only via command line with

  esxcfg-vswitch –B <state> <vSwitch>

  - States
    - Listen
    - Advertise
    - Both
    - Down

- Verify the setting with

  esxcfg-vswitch –b <vSwitch>

Getting information about the physical NICs

esxtop provides system-wide real-time traffic information

- For ESXi use resxtop utility provided in the RCLI

Type ‘n’ to switch to the network utilization screen

Output of esxtop

11:45:05pm up 5 min, 63 worlds; CPU load average: 0.00, 0.04, 0.00

PORT-ID	USED-BY	TEAM-PNIC	DNAME	PKTTX/s	MbTX/s	PKTRX/s	MbRX/s	%DRPTX	%DRPRX
16777217	vmnic0	-	vSwitch0	1.98	0.00	15.05	0.01	0.00	0.00
16777218	0:NCP	-	vSwitch0	0.00	0.00	0.00	0.00	0.00	0.00
16777219	0:CDP	-	vSwitch0	0.00	0.00	0.00	0.00	0.00	0.00
16777220	0:vswif0	vmnic0	vSwitch0	1.98	0.00	14.26	0.01	0.00	0.00
33554433	vmnic3	-	vSwitch1	0.00	0.00	13.27	0.01	0.00	0.00
33554434	0:NCP	-	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554435	vmnic4	-	vSwitch1	1597.13	1.19	1610.20	1.20	0.00	0.00
33554436	0:CDP	-	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554437	0:vswif10	vmnic3	vSwitch1	0.00	0.00	12.28	0.01	0.00	0.00
33554438	0:vmk-tcpip-10.17.41	vmnic4	vSwitch1	1597.13	1.19	1609.41	1.20	0.00	0.00

Getting information about the physical NICs

On ESX Server 3.5, running ifconfig inside Service Console provides information valuable for troubleshooting

Output of ifconfig

```
[root@osdc-sust005 root]# ifconfig
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:764267 errors:0 dropped:0 overruns:0 frame:0
          TX packets:764267 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:559614933 (533.6 Mb)  TX bytes:559614933 (533.6 Mb)

vmnic0    Link encap:Ethernet  HWaddr 00:11:85:13:79:9A
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:9235676 errors:0 dropped:0 overruns:0 frame:0
          TX packets:410441 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:666112677 (635.2 Mb)  TX bytes:202118997 (192.7 Mb)
          Interrupt:153

vmnic1    Link encap:Ethernet  HWaddr 00:11:85:13:79:9B
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:8989025 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:604831816 (576.8 Mb)  TX bytes:0 (0.0 b)
          Interrupt:161
```

Getting information about the physical NICs

esxcfg-info provides detailed information about the system

- Use '*esxcfg-info –n*' for network information
- Redirect the output of esxcfg-info to a file
- Look for the 'Physical Nic' section

```
[root@osdc-sust005 root]# esxcfg-info > info
[root@osdc-sust005 root]# vi info
[root@osdc-sust005 root]#
```

Getting information about the physical NICs

```
\==+Physical Nic :
   |----Name............................................vmnic0
   |----PCI Bus.........................................1
   |----PCI Slot........................................4
   |----PCI function....................................0
   |----MAC Address.....................................00:11:85:13:79:9a
   |----Virtual MAC Address.............................00:50:56:53:79:9a
   |----Driver..........................................tg3
   |----Network Hint....................................0 10.17.40.00/255.255.254.00
   |----MTU.............................................1500
   |----Configured Speed................................0
   |----Actual Speed....................................100
   |----Configured Duplex...............................0
   |----Actual Duplex...................................1
   |----Link Up.........................................true
   |----Wake on LAN supported ..........................true
   |----Wake on LAN enabled ............................true
   |----CDP Network.....................................false
   \==+Hardware Capabilities :
      |----Vlan Tag.....................................true
      |----Vlan Untag...................................true
      |----Checksum Offload.............................true
      |----Tcp Segmentation Offload.....................false
      |----Scatter Gather Tx............................true
   \==+Supported Speeds and Duplex :
      |----Supported Mode...............................auto/auto
      |----Supported Mode...............................10/half
      |----Supported Mode...............................10/full
      |----Supported Mode...............................100/half
      |----Supported Mode...............................100/full
      |----Supported Mode...............................1000/half
      |----Supported Mode...............................1000/full
   \==+PCI Device :
      |----Bus..........................................0x01
      |----Slot.........................................0x04
      |----Function.....................................0x00
      |----Vendor Id....................................0x14e4
      |----Device Id....................................0x16a7
      |----Sub-Vendor Id................................0x0e11
      |----Sub-Device Id................................0x00cb
      |----Vendor Name..................................Broadcom Corporation
      |----Device Name..................................NC7781 Gigabit Server Adapter (PCI-X, 10,100,1000-T)
      |----Device Class.................................512
      |----PIC Line.....................................3
      |----Service Console IRQ..........................38
      |----Vector.......................................153
```

Output of esxcfg-info

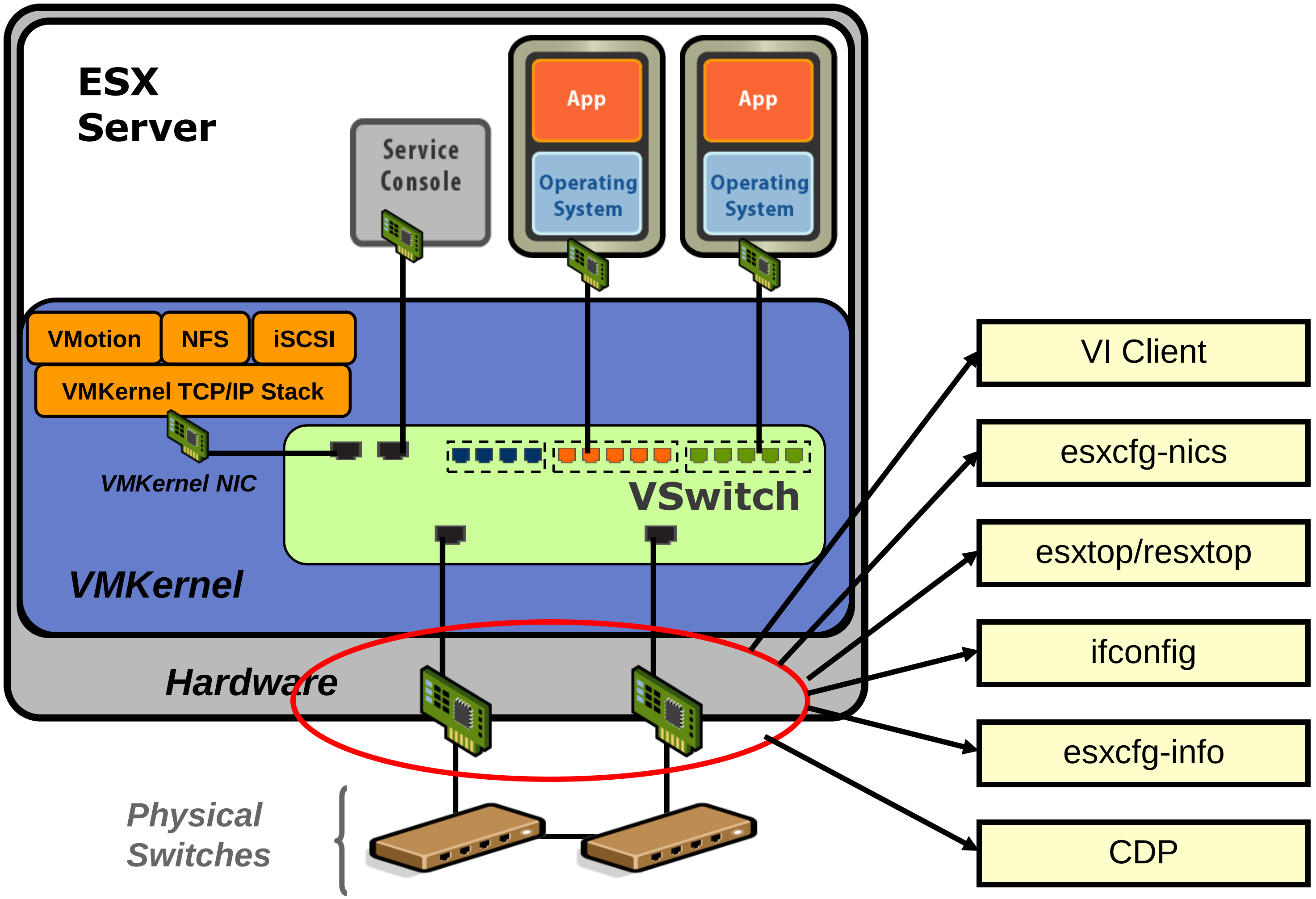
Getting information about the physical NICs

Search for vmnicX in the output of esxcfg-info

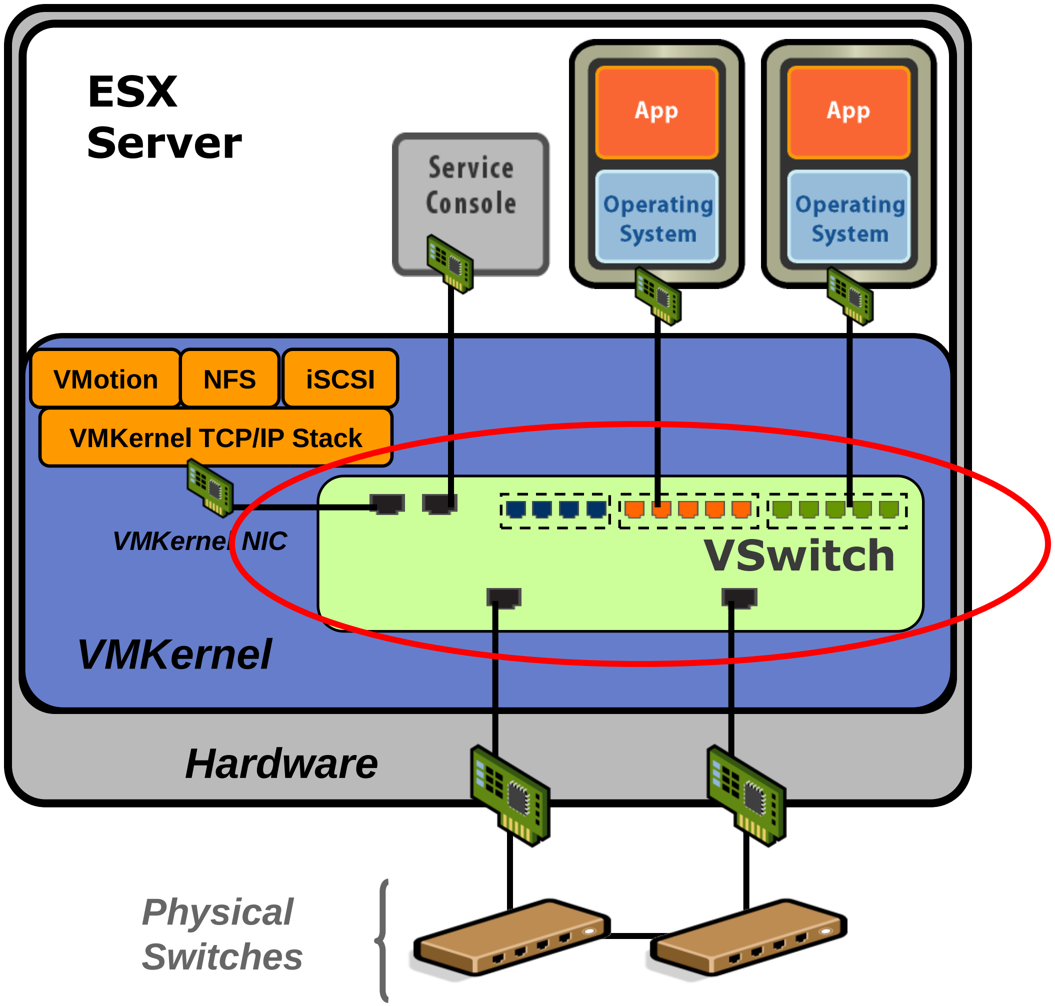
```
\==+Virtual Switch :
   |----Name.............................................vSwitch0
   |----Uplinks..........................................vmnic0
   |----Total Ports......................................64
   |----Configured Ports.................................64
   |----Used Ports.......................................4
   |----Beacon Enabled...................................false
   |----Beacon Interval..................................1
   |----Beacon Threshold.................................1
   |----Beacon Required By...............................
   |----CDP Status.......................................listen
   |----MTU..............................................1500
   |----Switch Class.....................................etherswitch
   \==+Unclaimed Ports :
      \==+Port :
         |----Port Id....................................16777217
         |----World Leader...............................0
         |----Client Name................................vmnic0
         |----MAC Addr...................................00:00:00:00:00:00
         |----Blocked....................................false
         |----Type.......................................Pnic
         \==+Stats :
            |----Packets Tx Ok...........................410963
            |----Bytes Tx Ok.............................202209073
            |----Dropped Tx..............................0
            |----Packets TSO Tx Ok.......................0
            |----Bytes TSO Tx Ok.........................0
            |----Dropped TSO Tx..........................0
            |----Packets SW TSO Tx.......................0
            |----Dropped SW TSO Tx.......................0
            |----Packets Zero Copy Tx Ok.................0
            |----Packets Rx Ok...........................9242292
            |----Bytes Rx Ok.............................666574263
            |----Dropped Rx..............................0
```

Output of esxcfg-info

Summary: Getting information about the physical NICs



Isolating Network Problems: Virtual Switch



Virtual Switch: What to look for?

vSwitch and Portgroup Configuration

- Uplinks
- VLAN Setting
- Layer 2 Security Policies
- NIC Teaming Configuration

esxcfg-vswitch
esxcfg-info
VI Client

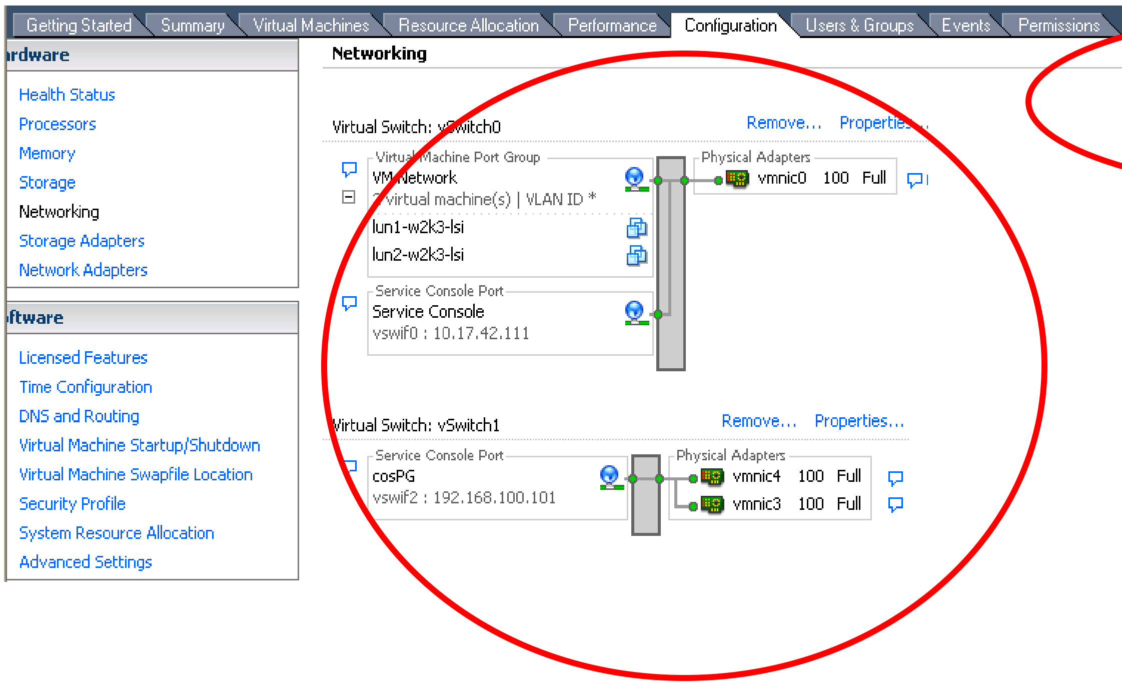
Is the traffic flowing through the vSwitch?

- Is the vSwitch dropping any packets?

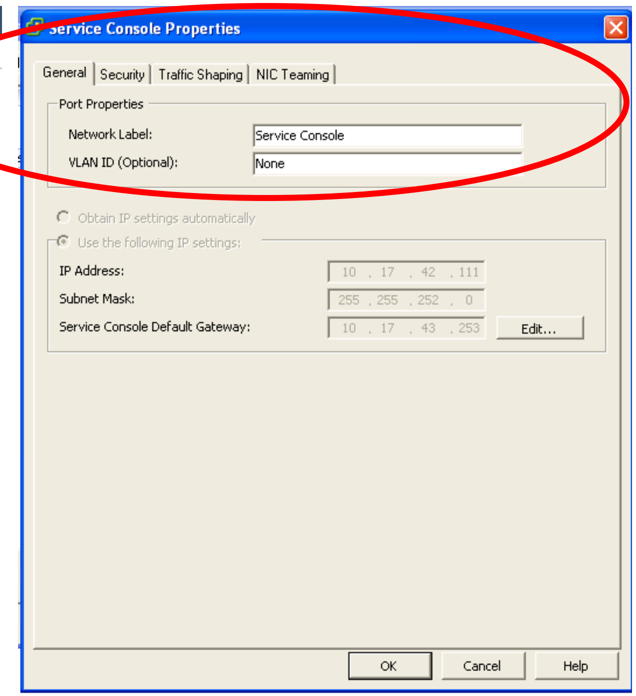
esxtop/resxtop
esxcfg-info

Getting information about the vSwitch: VI

VI: Virtual Switch Configuration



VI: Portgroup Properties



Getting information about the vSwitch: esxcfg-vswitch

esxcfg-vswitch

- An interface for adding, removing, and modifying virtual switches and their settings

Output of esxcfg-vswitch -l

```
[root@osdc-sust005 root]# esxcfg-vswitch -l
Switch Name    Num Ports   Used Ports  Configured Ports  MTU     Uplinks
vSwitch0       64          4           64                1500    vmnic0

  PortGroup Name      VLAN ID  Used Ports  Uplinks
  VM Network          0        0           vmnic0
  Service Console     0        1           vmnic0

Switch Name    Num Ports   Used Ports  Configured Ports  MTU     Uplinks
vSwitch1       64          4           64                1500    vmnic4,vmnic3

  PortGroup Name      VLAN ID  Used Ports  Uplinks
  cosPG               0        0           vmnic3,vmnic4
```

Getting information about the vSwitch: esxtop

esxtop provides system-wide real-time traffic information

- For ESXi use resxtop utility provided in the RCLI

Type ‘n’ to switch to the network utilization screen

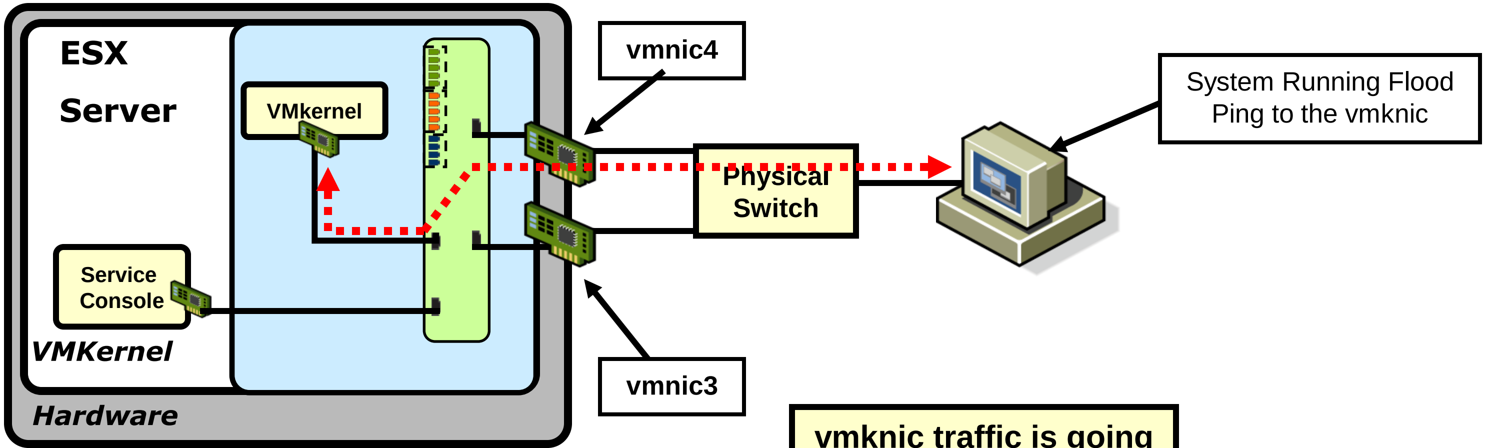
Real Time Traffic Information

Output of esxtop

11:45:05pm up 5 min, 63 worlds; CPU load average: 0.00, 0.04, 0.00

PORT-ID	USED-BY	TEAM-PNIC	DNAME	PKTTX/s	MbTX/s	PKTRX/s	MbRX/s	%DRPTX	%DRPRX
16777217	vmnic0	-	vSwitch0	1.98	0.00	15.05	0.01	0.00	0.00
16777218	0:NCP	-	vSwitch0	0.00	0.00	0.00	0.00	0.00	0.00
16777219	0:CDP	-	vSwitch0	0.00	0.00	0.00	0.00	0.00	0.00
16777220	0:vswif0	vmnic0	vSwitch0	1.98	0.00	14.26	0.01	0.00	0.00
33554433	vmnic3	-	vSwitch1	0.00	0.00	13.27	0.01	0.00	0.00
33554434	0:NCP	-	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554435	vmnic4	-	vSwitch1	1597.13	1.19	1610.20	1.20	0.00	0.00
33554436	0:CDP	-	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554437	0:vswif10	vmnic3	vSwitch1	0.00	0.00	12.28	0.01	0.00	0.00
33554438	0:vmk-tcpip-10.17.41	vmnic4	vSwitch1	1597.13	1.19	1609.41	1.20	0.00	0.00

Getting information about the vSwitch: esxtop



vmknic traffic is going through vmnic4

Output of esxtop

11:45:05pm up 5 min, 63 worlds; CPU load average: 0.00, 0.04, 0.00

PORT-ID	USED-BY	TEAM-PNIC	DNAME	PKTTX/s	MbTX/s	PKTRX/s	MbRX/s	%DRPTX	%DRPRX
16777217	vmnic0	-	vSwitch0	1.98	0.00	15.05	0.01	0.00	0.00
16777218	0:NCP	-	vSwitch0	0.00	0.00	0.00	0.00	0.00	0.00
16777219	0:CDP	-	vSwitch0	0.00	0.00	0.00	0.00	0.00	0.00
16777220	0:vswif0	vmnic0	vSwitch0	1.98	0.00	14.26	0.01	0.00	0.00
33554433	vmnic3	-	vSwitch1	0.00	0.00	13.27	0.01	0.00	0.00
33554434	0:NCP	-	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554435	vmnic4	-	vSwitch1	1597.13	1.19	1610.20	1.20	0.00	0.00
33554436	0:CDP	-	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554437	0:vswif10	vmnic3	vSwitch1	0.00	0.00	12.28	0.01	0.00	0.00
33554438	0:vmk-tcpip-10.17.41	vmnic4	vSwitch1	1597.13	1.19	1609.41	1.20	0.00	0.00

Getting information about the vSwitch: esxcfg-info

esxcfg-info provides information in greater detail

- Configuration information

Output of esxcfg-info

```
\==+Virtual Switch :
   |----Name..........................................vSwitch1
   |----Uplinks.......................................vmnic4,vmnic3
   |----Total Ports...................................64
   |----Configured Ports..............................64
   |----Used Ports....................................6
   |----Beacon Enabled................................false
   |----Beacon Interval...............................1
   |----Beacon Threshold..............................1
   |----Beacon Required By............................
   |----CDP Status....................................listen
   |----MTU...........................................1500
   |----Switch Class..................................etherswitch
```

Getting information about the vSwitch: esxcfg-info

esxcfg-info provides information in greater detail

- Cumulative traffic information for each port on the vSwitch

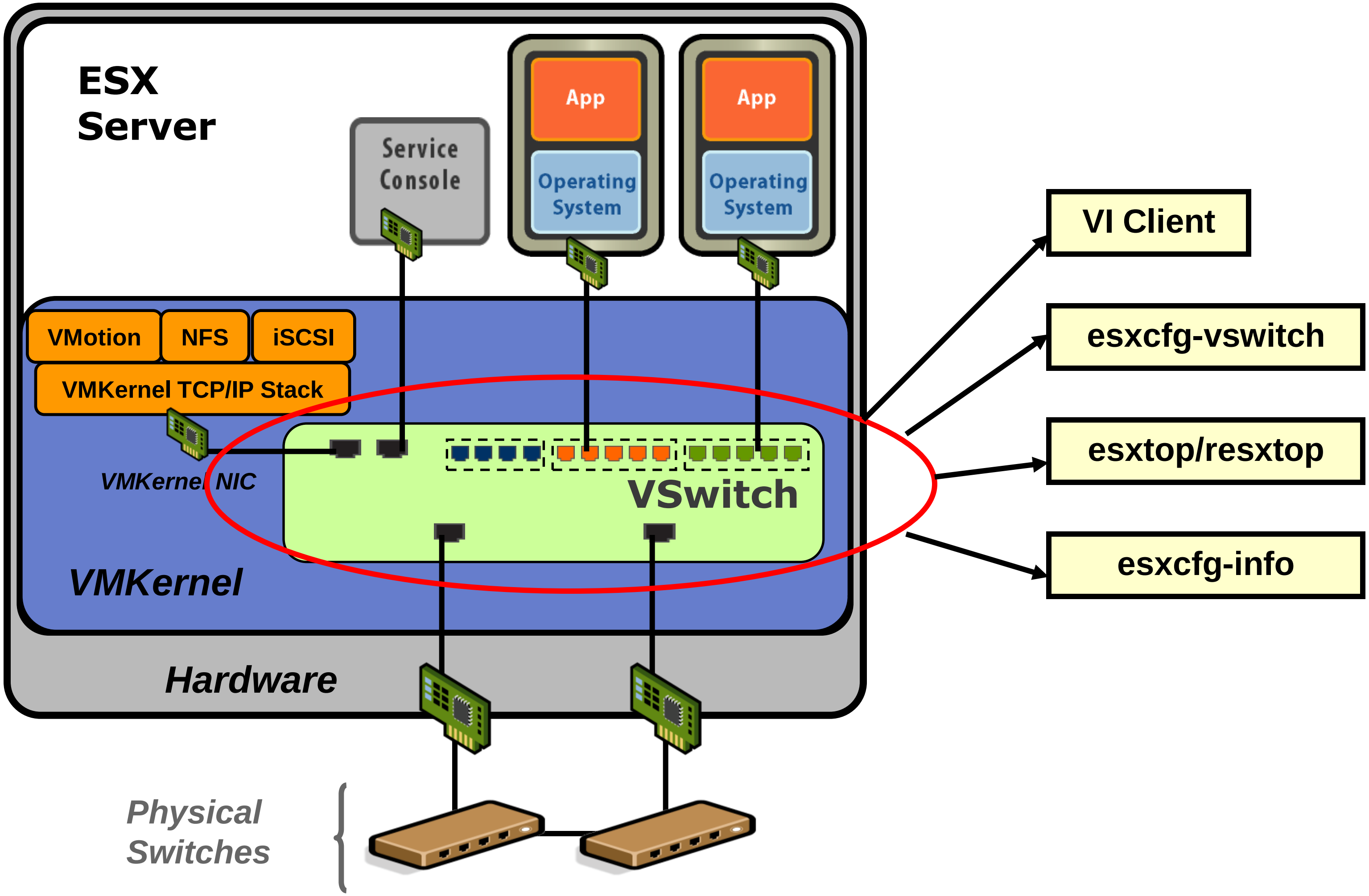
```
\==+Port :
   |----Port Id............................33554438
   |----World Leader........................0
   |----Client Name.........................vmk-tcpip-10.17.41.72
   |----MAC Addr............................00:50:56:7e:31:61
   |----Blocked.............................false
   |----Type................................Tcp/Ip
   |----Portgroup Name......................vmkPG
   \==+Stats :
      |----Packets Tx Ok....................84489
      |----Bytes Tx Ok......................8281172
      |----Dropped Tx.......................0
      |----Packets TSO Tx Ok................0
      |----Bytes TSO Tx Ok..................0
      |----Dropped TSO Tx...................0
      |----Packets SW TSO Tx................0
      |----Dropped SW TSO Tx................0
      |----Packets Zero Copy Tx Ok..........0
      |----Packets Rx Ok....................113655
      |----Bytes Rx Ok......................10153132
      |----Dropped Rx.......................0
      |----Dropped TSO Rx...................0
      |----Packets SW TSO Rx................0
      |----Dropped SW TSO Rx................0
      |----Actions..........................113495
      |----Uplink Rx Packets................142780
      |----Pks Billed.......................24406
      |----Dropped Tx Due to Page Absent....0
      |----Dropped Rx Due to Page Absent....0
```

Information about VMkernel Port

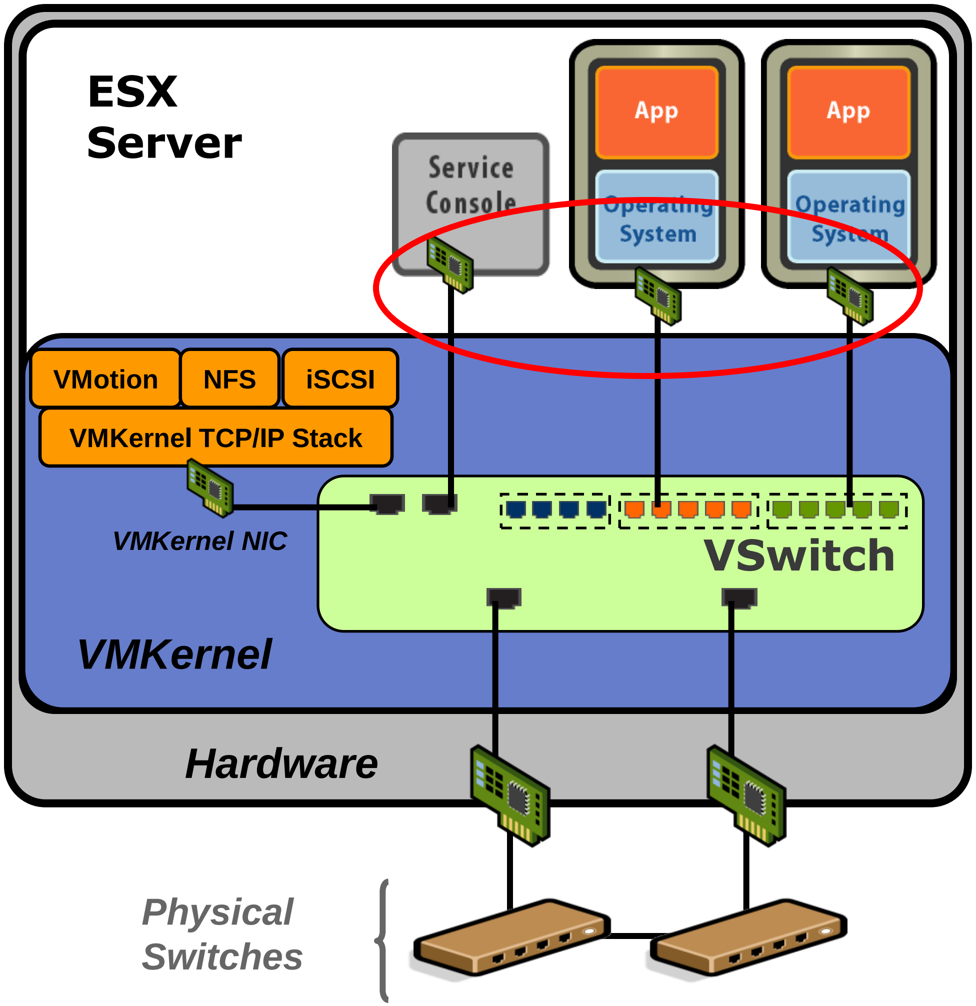
```
\==+Port :
   |----Port Id...................................33554435
   |----World Leader..............................0
   |----Client Name...............................vmnic4
   |----MAC Addr..................................00:00:00:00:00:00
   |----Blocked...................................false
   |----Type......................................Pnic
   \==+Stats :
      |----Packets Tx Ok..........................84488
      |----Bytes Tx Ok............................8281112
      |----Dropped Tx.............................0
      |----Packets TSO Tx Ok......................0
      |----Bytes TSO Tx Ok........................0
      |----Dropped TSO Tx.........................0
      |----Packets SW TSO Tx......................0
      |----Dropped SW TSO Tx......................0
      |----Packets Zero Copy Tx Ok................0
      |----Packets Rx Ok..........................118277
      |----Bytes Rx Ok............................10538216
      |----Dropped Rx.............................0
      |----Dropped TSO Rx.........................0
      |----Packets SW TSO Rx......................0
      |----Dropped SW TSO Rx......................0
      |----Actions................................0
      |----Uplink Rx Packets......................0
      |----Pks Billed.............................0
      |----Dropped Tx Due to Page Absent..........0
      |----Dropped Rx Due to Page Absent..........0
```

Information about Uplink Port (vmnic4)

Summary: Getting information about the vSwitch



Isolating Network Problems: Virtual NICs



Virtual NICs: What to look for?

Does the device show up?

- Is the driver loaded?

Physical properties of the link

- Link State
- MTU settings

esxcfg-vswif

esxcfg-vmknic

Guest specific utilities

- Linux
  - ifconfig
  - lspci
- Windows
  - Device Manager

Is the vNIC connected to the correct portgroup?

- Portgroup using the correct uplink
- Portgroup with the correct security properties

VI Client

.vmx file

esxcfg-info

Is the NIC working?

- Does the NIC have an IP address?
- Is the NIC transmitting and receiving packets?
- Is the NIC dropping any packets?

Guest specific utilities

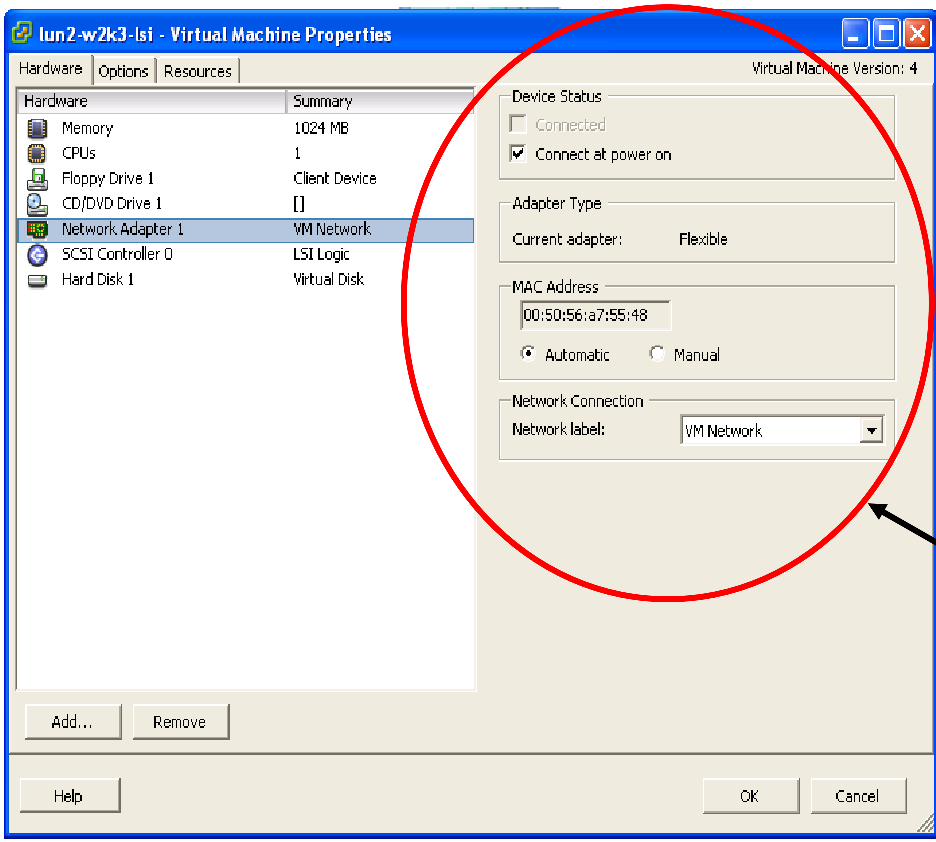
- Linux
  - ifconfig
- Windows
  - Network Connections

esxtop/resxtop

esxcfg-info

Getting information about the vNIC

VI: Virtual Machine Properties



.vmx file

```
ethernet0.present = "true"
ethernet0.allowGuestConnectionControl = "false"
ethernet0.networkName = "VM Network"
ethernet0.addressType = "vpx"
ethernet0.generatedAddress = "00:50:56:a7:55:48"
```

VM's Connection Information

Getting information about the vNIC

esxcfg-vswif

- An interface to configure Service Console NIC

esxcfg-vmknic

- An interface to configure VMkernel NIC

Output of esxcfg-vswif -l

```
[root@osdc-sust005 root]# esxcfg-vswif -l
Name     Port Group       IP Address      Netmask         Broadcast       Enabled   DHCP
vswif0   Service Console  10.17.42.111    255.255.252.0   10.17.43.255    true      false
vswif10  cosPG            10.17.40.156    255.255.252.0   10.17.43.255    true      true
```

Output of esxcfg-vmknic -l

```
[root@osdc-sust005 root]# esxcfg-vmknic -l
Interface  Port Group       IP Address     Netmask         Broadcast      MAC Address       MTU     TSO MSS   Enabled
vmk0       vmkPG            10.17.41.72    255.255.252.0   10.17.43.255   00:50:56:7e:31:61 1500    40960     true
```

Getting information about the vNIC

Output of esxtop

```
11:45:05pm up 5 min, 63 worlds; CPU load average: 0.00, 0.04, 0.00
```

PORT-ID	USED-BY	TEAM-PNIC	DNAME	PKTTX/s	MbTX/s	PKTRX/s	MbRX/s	%DRPTX	%DRPRX
16777217	vmnic0	-	vSwitch0	1.98	0.00	15.05	0.01	0.00	0.00
16777218	0:NCP	-	vSwitch0	0.00	0.00	0.00	0.00	0.00	0.00
16777219	0:CDP	-	vSwitch0	0.00	0.00	0.00	0.00	0.00	0.00
16777220	0:vswif0	vmnic0	vSwitch0	1.98	0.00	14.26	0.01	0.00	0.00
33554433	vmnic3	-	vSwitch1	0.00	0.00	13.27	0.01	0.00	0.00
33554434	0:NCP	-	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554435	vmnic4	-	vSwitch1	1597.13	1.19	1610.20	1.20	0.00	0.00
33554436	0:CDP	-	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554437	0:vswif10	vmnic3	vSwitch1	0.00	0.00	12.28	0.01	0.00	0.00
33554438	0:vmk-tcpip-10.17.41	vmnic4	vSwitch1	1597.13	1.19	1609.41	1.20	0.00	0.00

Output of esxcfg-info

```
\==+Port :
   |----Port Id...............................33554438
   |----World Leader..........................0
   |----Client Name...........................vmk-tcpip-10.17.41.72
   |----MAC Addr..............................00:50:56:7e:31:61
   |----Blocked...............................false
   |----Type..................................Tcp/Ip
   |----Portgroup Name........................vmkPG
   \==+Stats :
      |----Packets Tx Ok......................84489
      |----Bytes Tx Ok........................8281172
      |----Dropped Tx.........................0
      |----Packets TSO Tx Ok..................0
      |----Bytes TSO Tx Ok....................0
      |----Dropped TSO Tx.....................0
      |----Packets SW TSO Tx..................0
      |----Dropped SW TSO Tx..................0
      |----Packets Zero Copy Tx Ok............0
      |----Packets Rx Ok......................113655
      |----Bytes Rx Ok........................10153132
```

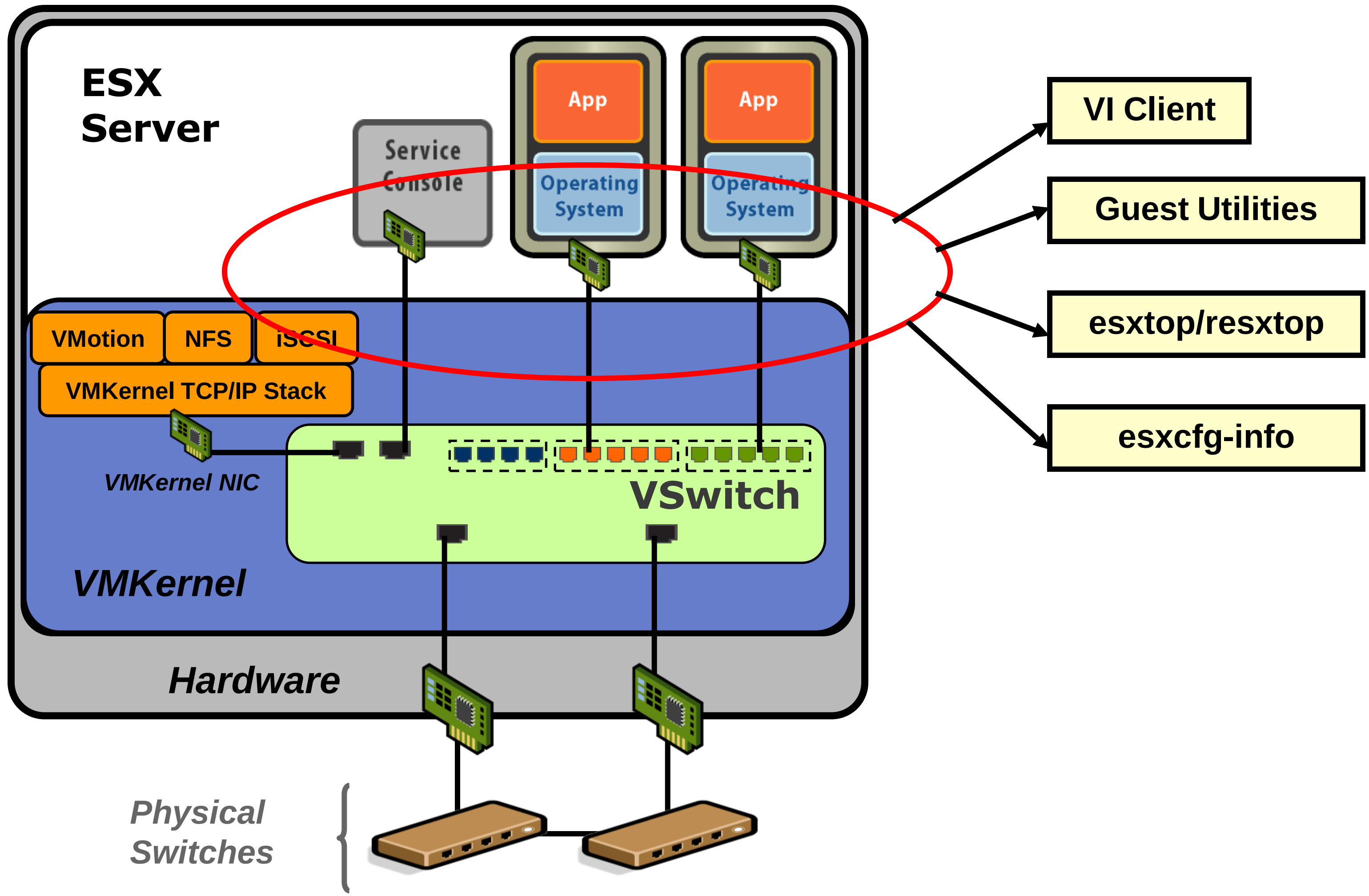
Real time traffic information

Look for Rx/Tx information for the vNIC you are interested in

Search for the port ID of the vNIC in the esxcfg-info output

Cumulative Traffic Information

Summary: Getting information about the vNIC



Sniffing For Trouble

Sniff for packets at different layers for isolation

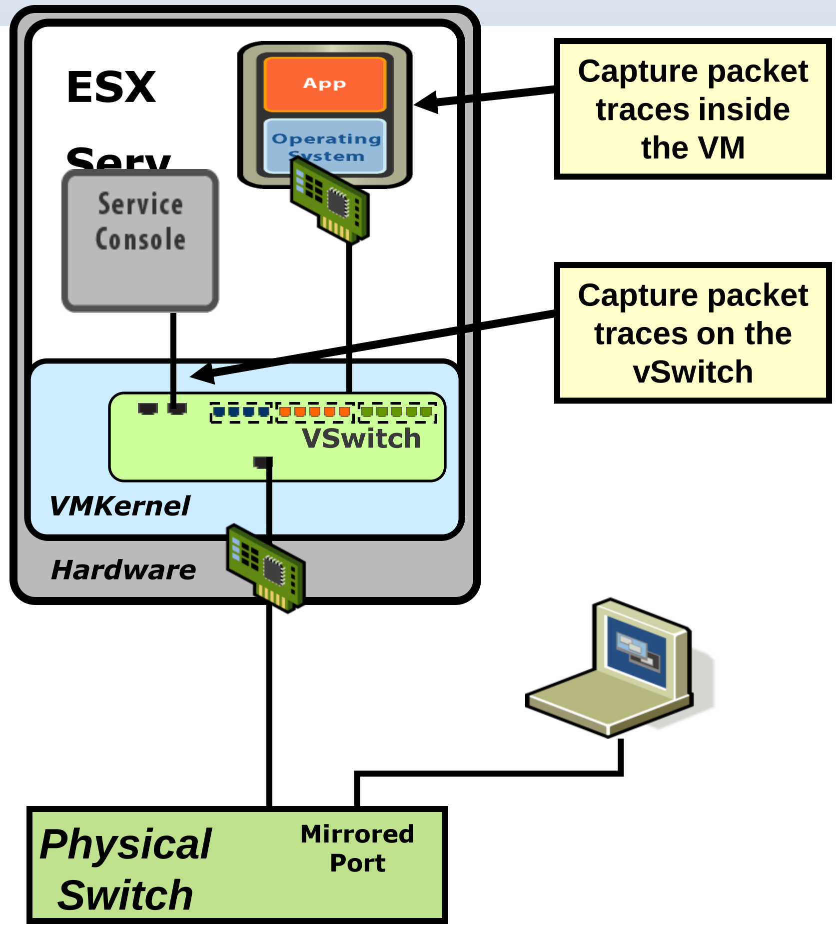
- Physical Switch Port Level
- vSwitch Level
- VM Level

Look for

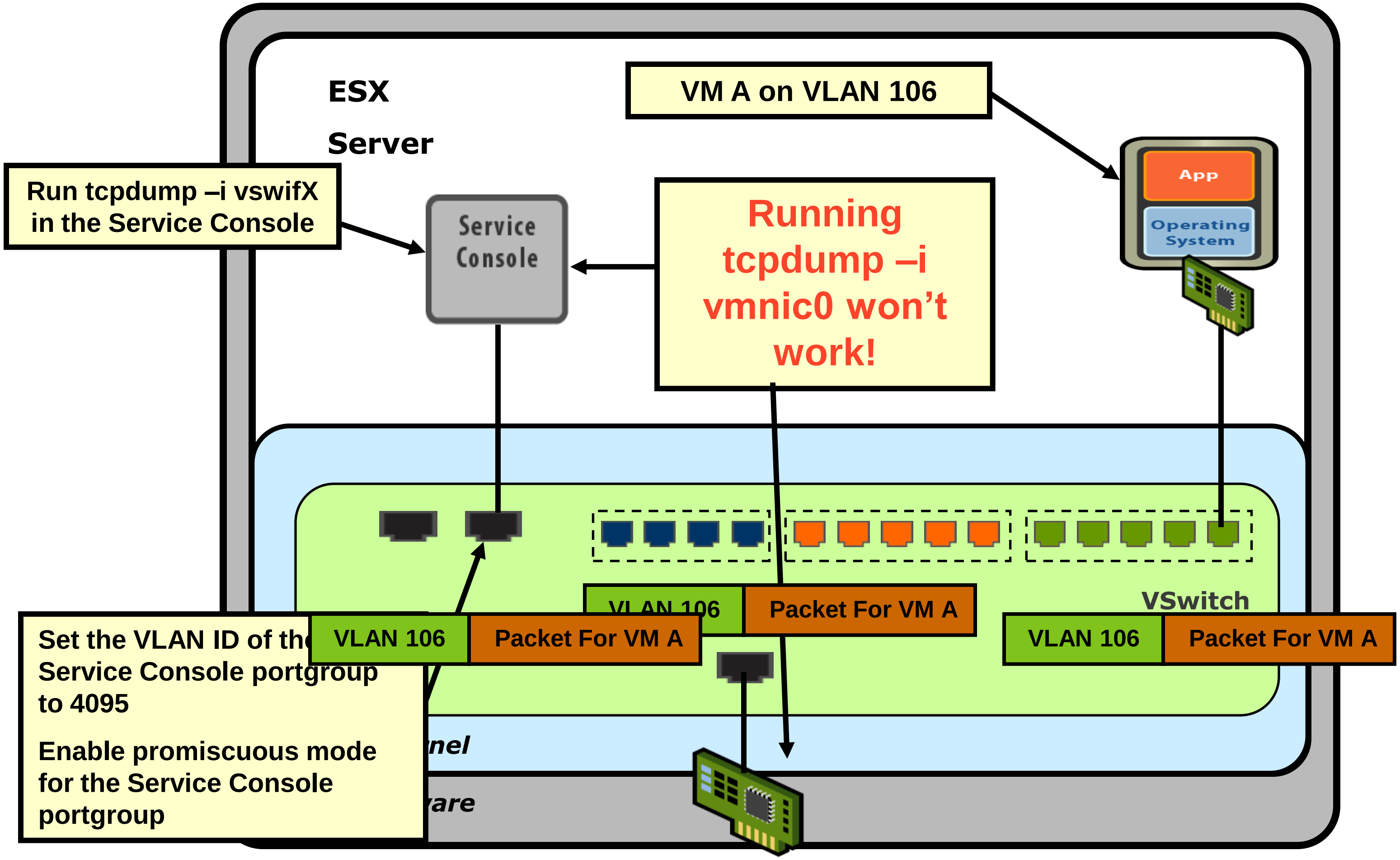
- Lost Packets
- Large number of packet retransmissions
- Anomalies reported by protocol analyzers like Wireshark etc.

Look for patterns

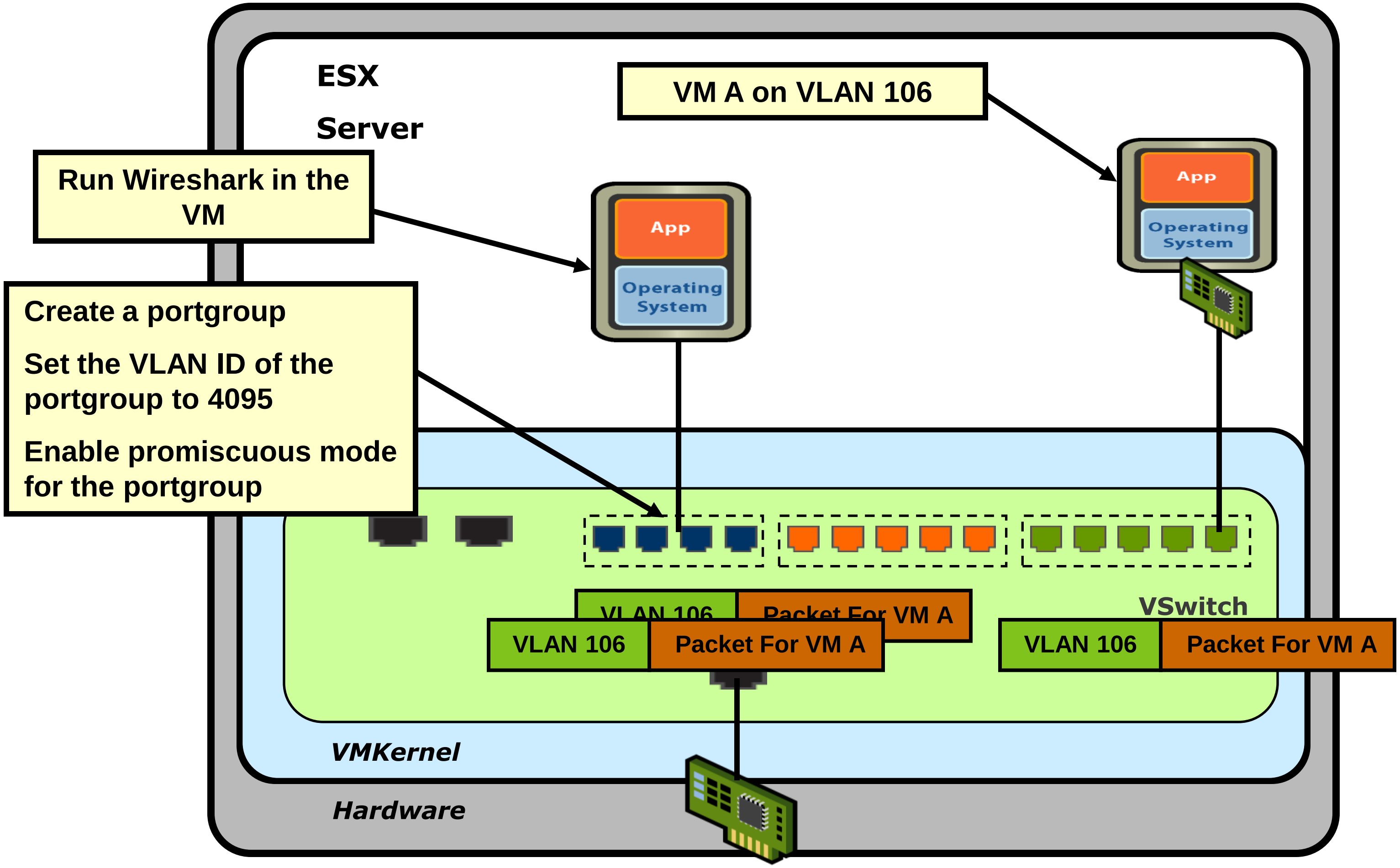
- Are packets of a certain type causing problems?
- Are packets of a certain size causing problems?



Collecting Network Traces on the vSwitch



Collecting Network Traces on the vSwitch



Logs on ESX

VMkernel logs

- */var/log/vmkernel* for ESX
- */var/log/messages* for ESXi

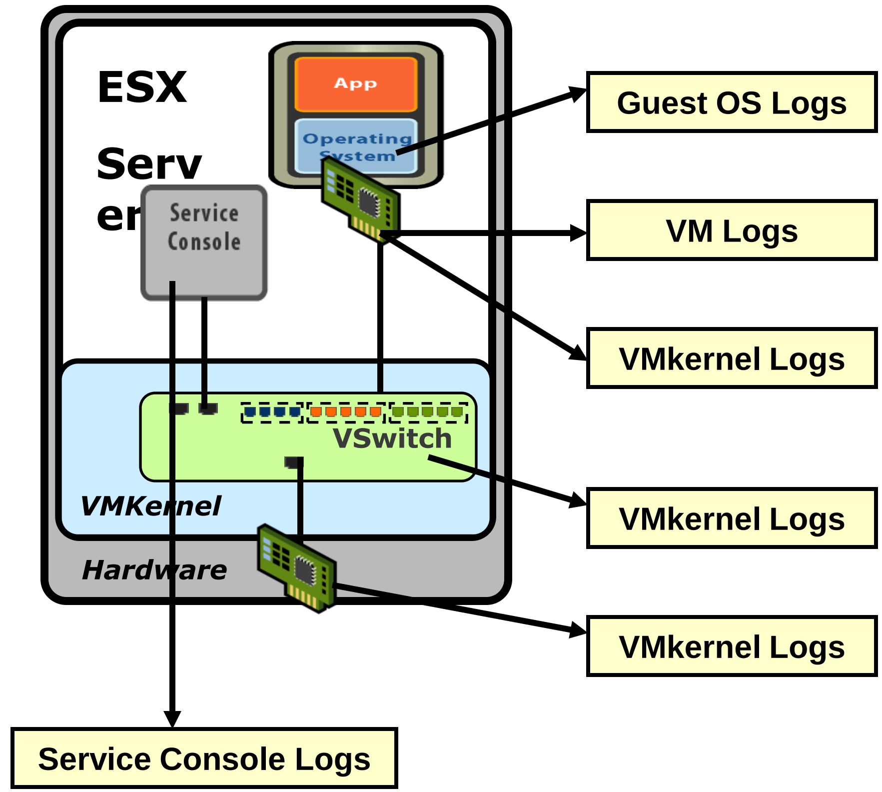
VM logs

- *vmware.log* file in the VM directory

Service console logs

- */var/log/messages* for ESX

Also check the guest OS logs for any errors



Troubleshooting Scenarios

Signs of trouble

Basic connectivity problems

- No network connectivity on some or all of the VMs on a vSwitch

Flaky network connection

- Connection timeouts
- Intermittent loss of connectivity

Problem

***<u>None</u>* of the VMs on my ESX box have network connectivity**

Step 1: Check inside the VM

Has the guest OS detected the vNIC?

- Use OS specific utilities to check
  - Windows: Device Manager
  - Linux: lspci, ifconfig
- If a network interface for the vNIC does not show up
  - Check the VM configuration using VI or by looking into the .vmx file
  - Check the VM's log file (*vmware.log*) for any obvious problems
  - Check the guest OS log files for any obvious problems
    - Is appropriate driver for the vNIC installed and loaded?
    - Install VMware tools inside the guest

Step 1: Check inside the VM

Is the network interface in the guest up and does it have an IP address?

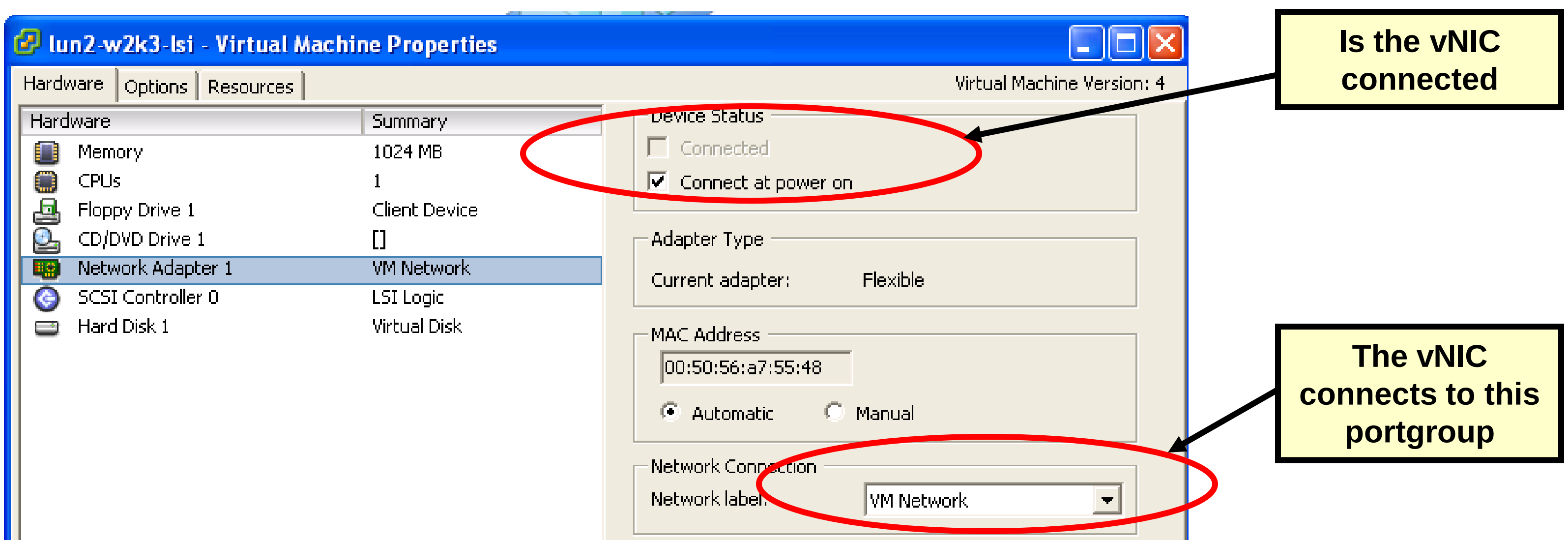
- Use OS specific utilities to check
  - Windows: Network connections, ipconfig
  - Linux: ifconfig
- Use static IP addresses during troubleshooting

Step 2: Check the vNIC connection

Check if the vNIC is connected to the correct portgroup

- Use VI or look into the *.vmx* file
- Make sure the ‘Connected’ box is checked

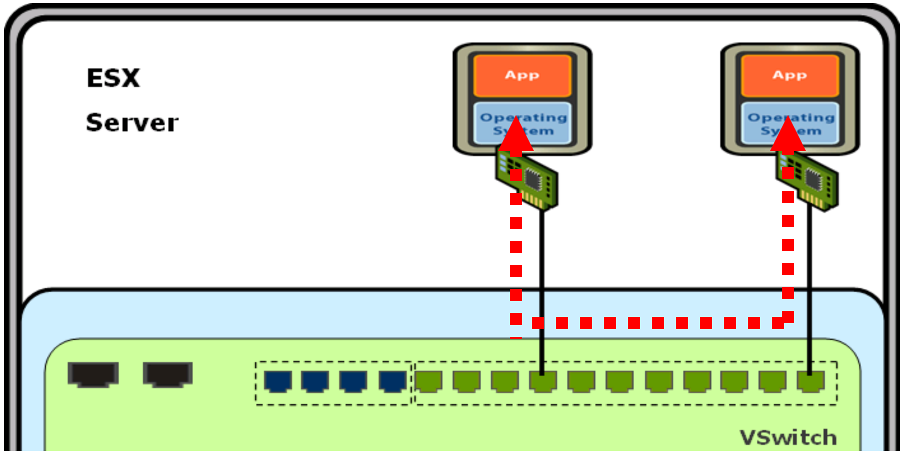
VI: Virtual Machine Properties



Step 2: Check the vNIC connection

Check connectivity between VMs on the same portgroup

- At this point you should be able to communicate with another VM on the same portgroup
  - If not
    - Look at the receive and transmit byte counters in the VMs to see what is going on
    - Look at esxtop, esxcfg-info for any dropped packets on the ports
    - Check firewall settings in the guest



Step 3: Check the physical NIC

Check if the uplinks connected to vSwitch and the portgroup are correct

- Use VI or esxcfg-vswitch -l

Check if the physical NIC is receiving and transmitting data

- Check the RX and TX counter using ifconfig, esxcfg-info or esxtop
- Check if Tx/Rx error counters are incrementing
- Check the VMkernel logs for any errors

Check if the physical NICs are connected to the correct physical switch ports

- Use CDP or Network Hints

Step 4: Check VLAN Configuration

Check who is tagging and stripping the VLAN IDs?

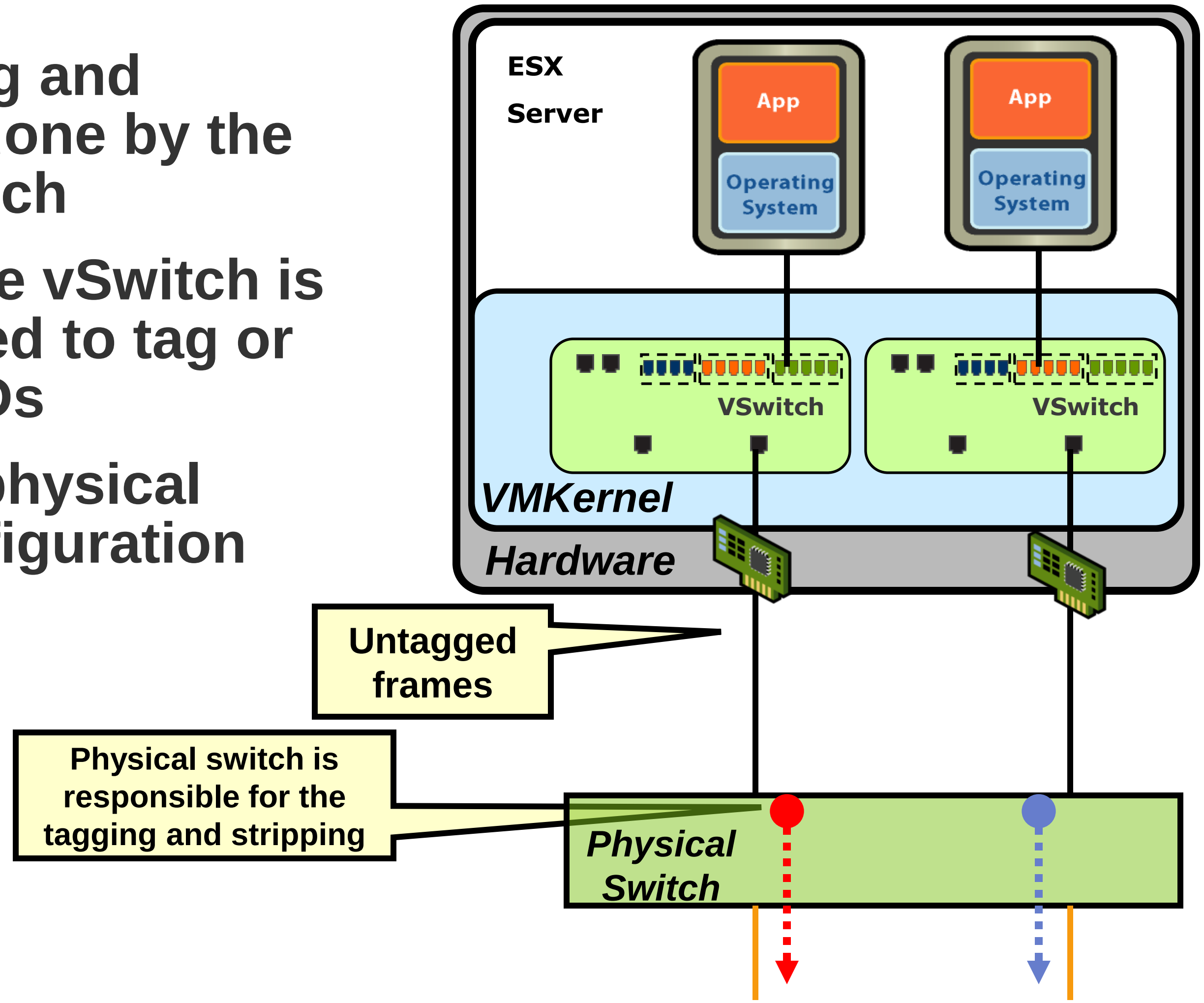
- External Switch Tagging
  - Only the physical switch tags and strips VLAN IDs
- Virtual Switch Tagging
  - Only the vSwitch tags and strips VLAN IDs
- Virtual Guest Tagging
  - Only the guest tags and strips VLAN IDs

Step 4: Check VLAN Configuration: EST

VLAN tagging and stripping is done by the physical switch

Make sure the vSwitch is not configured to tag or strip VLAN IDs

Check your physical network configuration

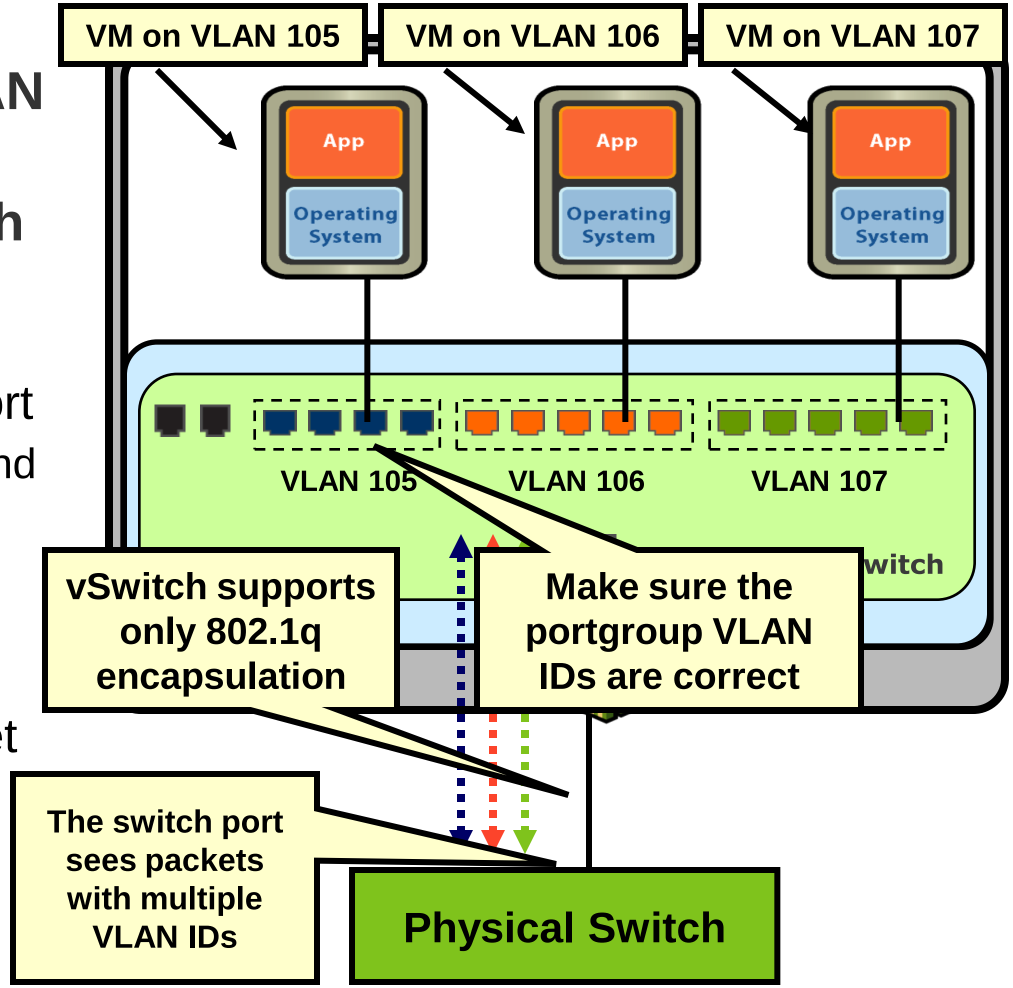


Step 4: Check VLAN Configuration: VST

Check the portgroup VLAN ID

Check the physical switch port configuration

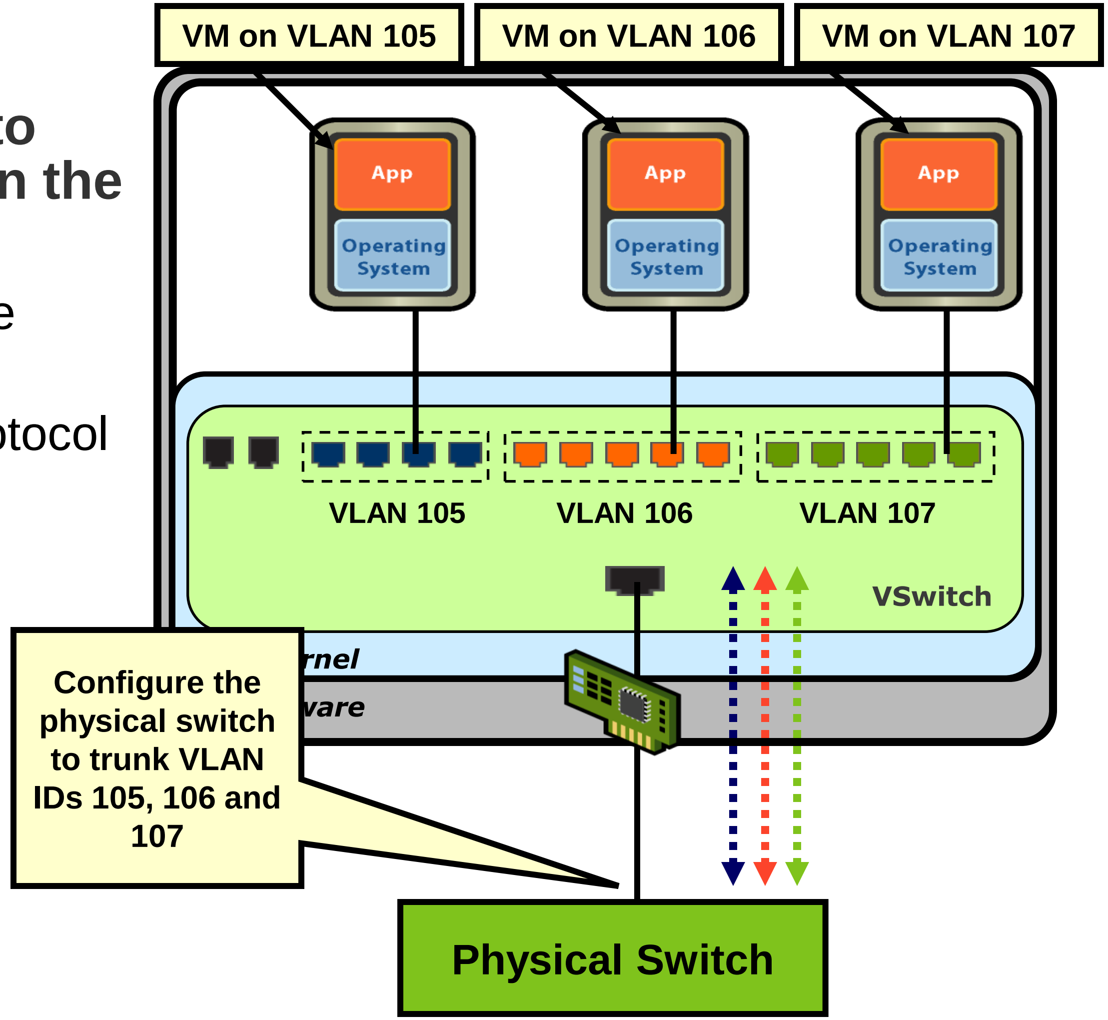
- Physical switch port should be configured as a trunk port
  - Trunking should be static and unconditional
  - No Dynamic Trunking Protocol (DTP)
- Physical switch port trunk encapsulation should be set to 802.1q
  - No ISL, LANE etc



Step 4: Check VLAN Configuration: VST

Check if the physical switch is configured to trunk all the VLANs on the vSwitch

- Manually specify all the VLANs to be trunked
- No VLAN Trunking Protocol (VTP)

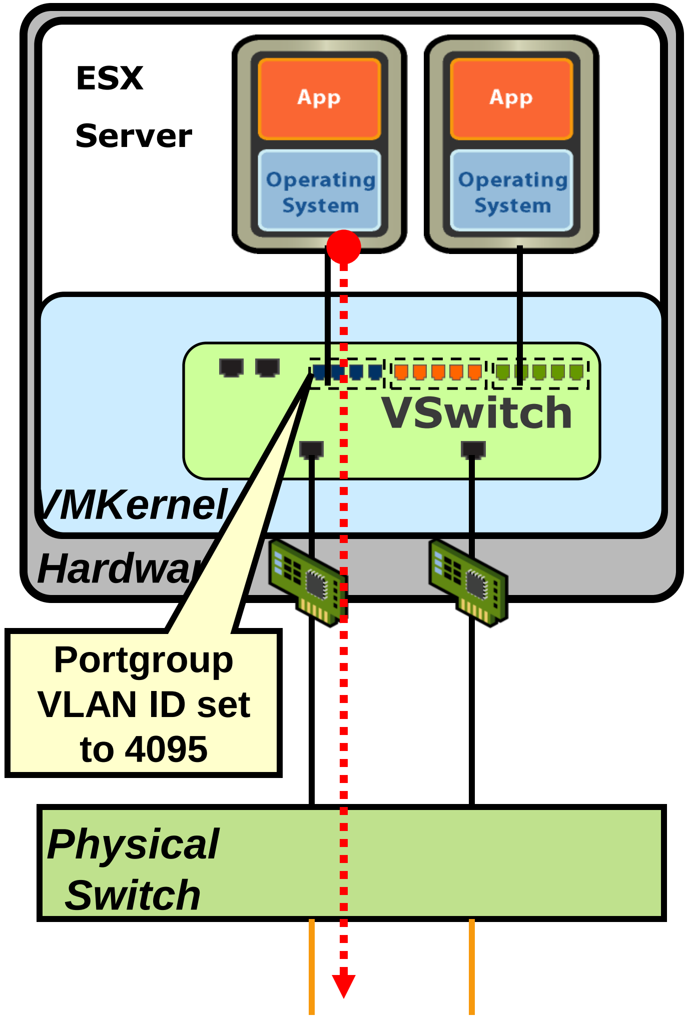


Step 4: Check VLAN Configuration: VGT

Check if the portgroup VLAN Id is set to 4095

Check physical switch configuration

- Physical switch port should be a statically trunked
- Physical switch should be configured to expect frames with the specific VLAN IDs on the port
- Physical switch port trunk encapsulation should be set to 802.1q



Step 4: Check VLAN Configuration: Native VLAN

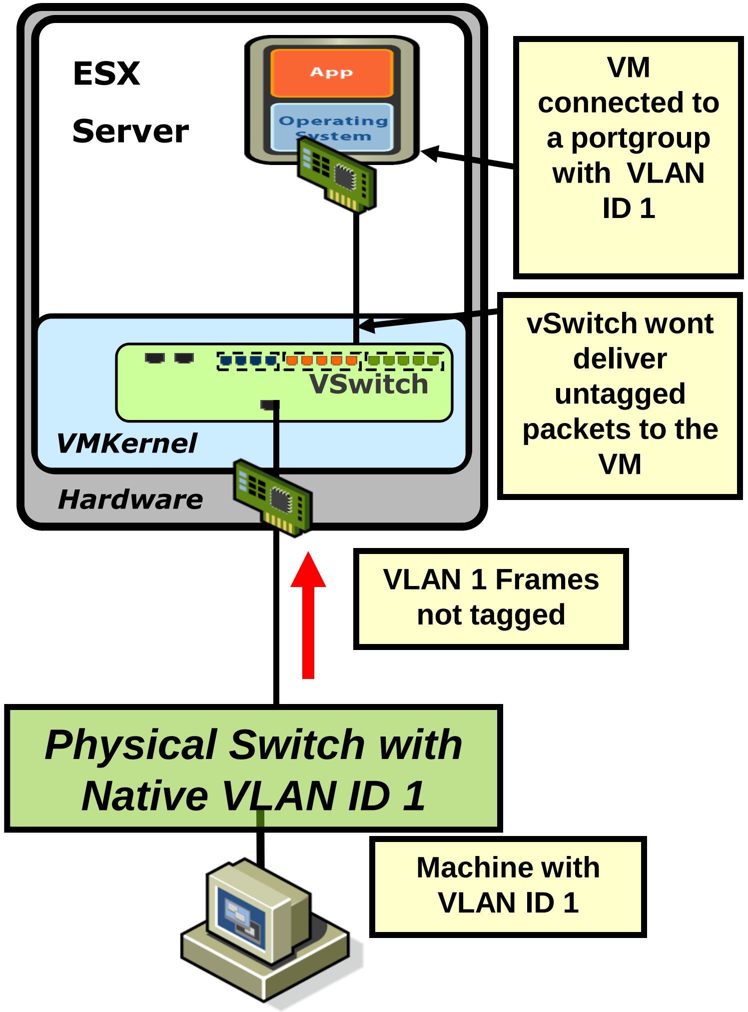
Don’t use native VLAN for regular traffic

- Default native VLAN is often VLAN 1

If you have to use default native VLAN for regular data traffic, do one of the following:

- Change the native VLAN on the physical switch
- Force tagging of native VLAN frames

Might need to change native VLAN behavior on all neighboring switches



Problem

Some **of the VMs on a vSwitch have network connectivity, other don't**

Step 1: Round up the Usual Suspects

Check the vNIC on the VM

- Check if the vNIC is connected to the correct portgroup
- Check if VM to VM traffic on the same portgroup works

Check if the physical NIC is connected to the right port/switch

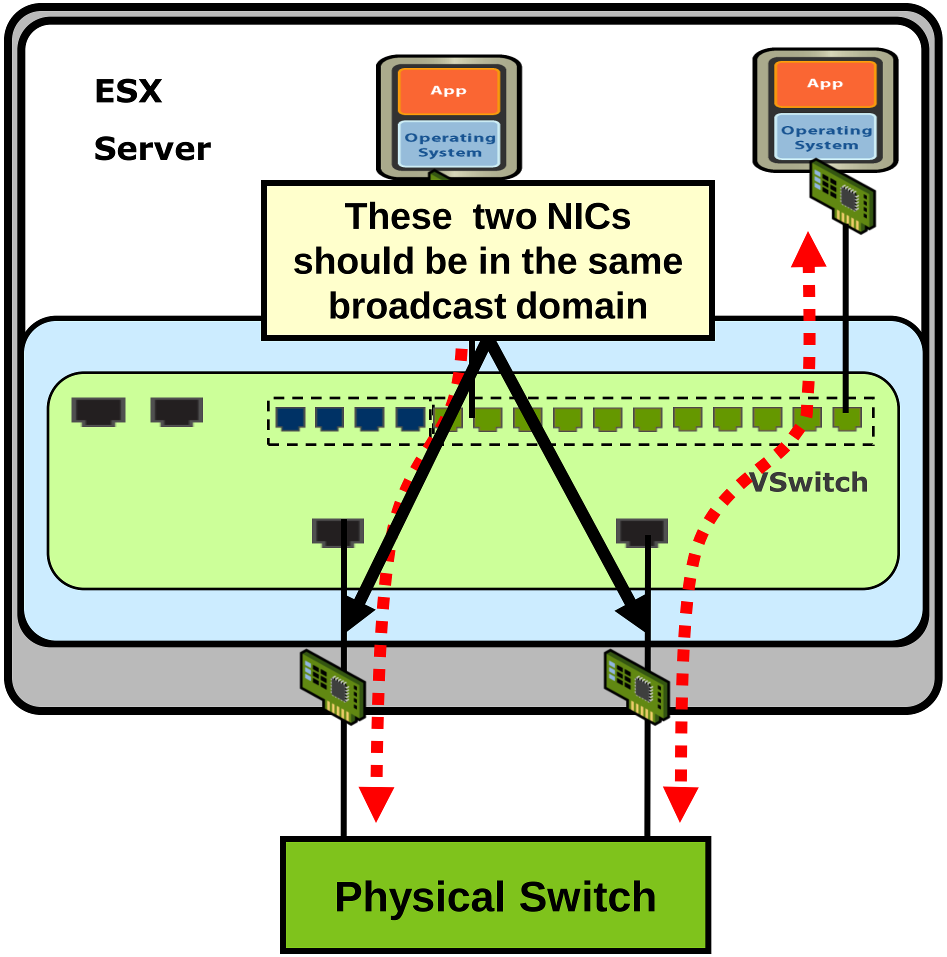
- Use CDP

Step 2: NIC Teaming

The two VMs could be using different uplinks

NICs in a team should be connected to the same broadcast domain

- Look at the Network Hint



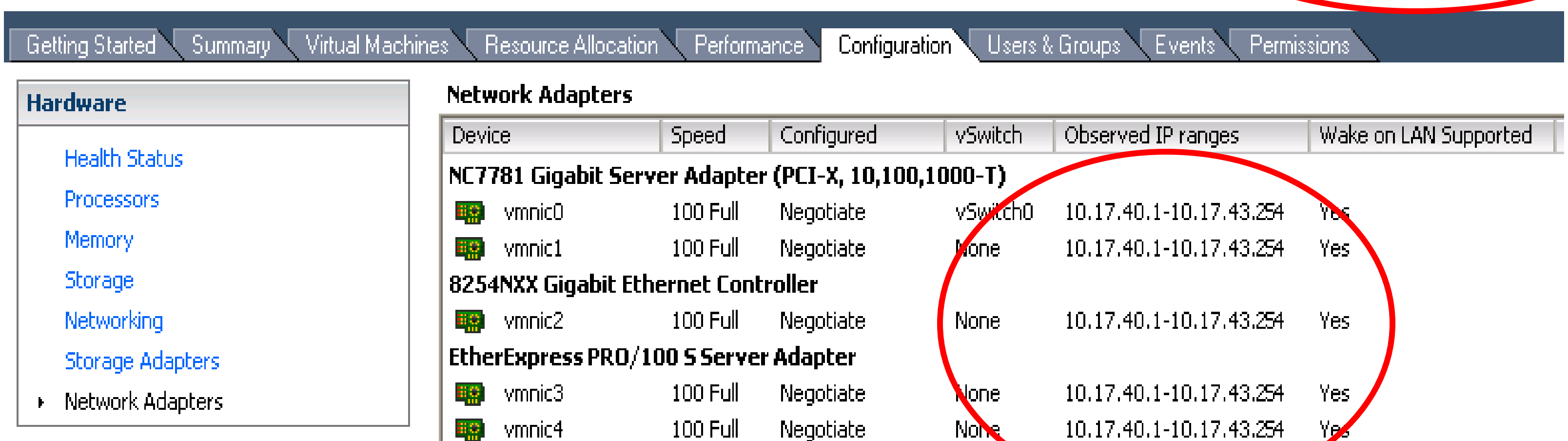
Step 2: NIC Teaming

VI

esxcfg-info

- Search for ‘Network Hint’ in the output

```
\==+Physical Nic :
   |----Name..............................................vmnic0
   |----PCI Bus...........................................1
   |----PCI Slot..........................................4
   |----PCI function......................................0
   |----MAC Address.......................................00:11:85:13:79:9a
   |----Virtual MAC Address...............................00:50:56:53:79:9a
   |----Driver............................................tg3
   |----Network Hint......................................0 10.17.40.00/255.255.254.00
```

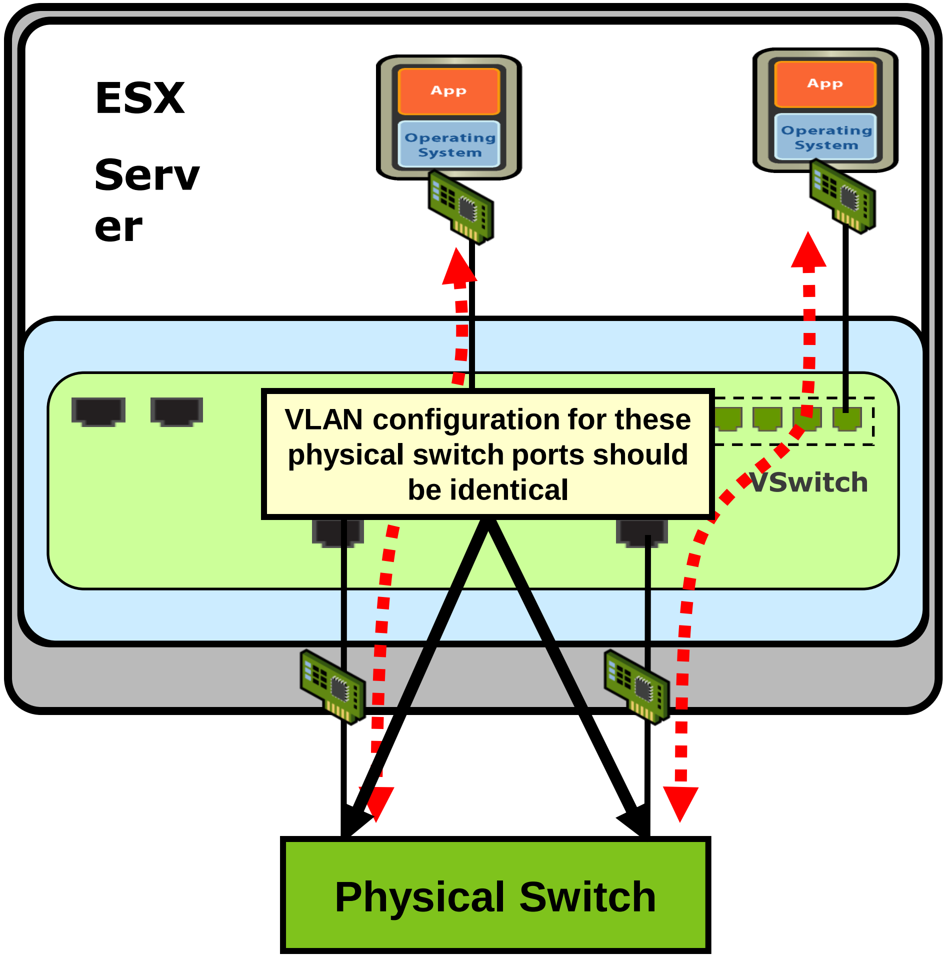


Device	Speed	Configured	vSwitch	Observed IP ranges	Wake on LAN Supported
NC7781 Gigabit Server Adapter (PCI-X, 10,100,1000-T)					
vmnic0	100 Full	Negotiate	vSwitch0	10.17.40.1-10.17.43.254	Yes
vmnic1	100 Full	Negotiate	None	10.17.40.1-10.17.43.254	Yes
8254NXX Gigabit Ethernet Controller					
vmnic2	100 Full	Negotiate	None	10.17.40.1-10.17.43.254	Yes
EtherExpress PRO/100 S Server Adapter					
vmnic3	100 Full	Negotiate	None	10.17.40.1-10.17.43.254	Yes
vmnic4	100 Full	Negotiate	None	10.17.40.1-10.17.43.254	Yes

Step 3: VLAN Configuration

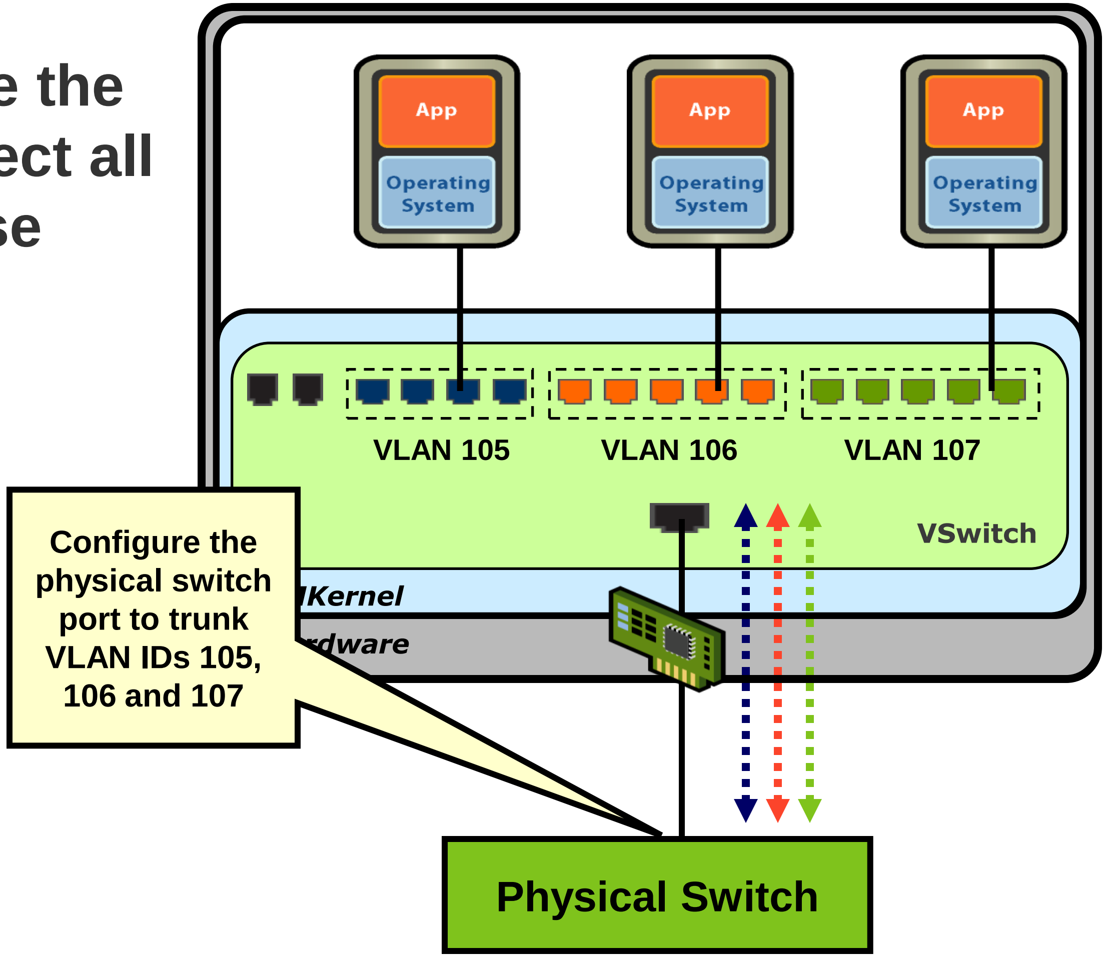
The two VMs could be using different uplinks

VLAN configuration on physical switch ports connected to NICs in a team should be identical



Step 3: VLAN Configuration

Manually configure the switch port to expect all the VLAN IDs in use



Problem

VMs have intermittent network connection

Step 1: Round up the Usual Suspects

Check the vNIC on the VM

- Check if VM to VM traffic on the same portgroup works without intermittent problems

Check VLAN configuration

- Identical VLAN configuration on physical switch ports that are in a team

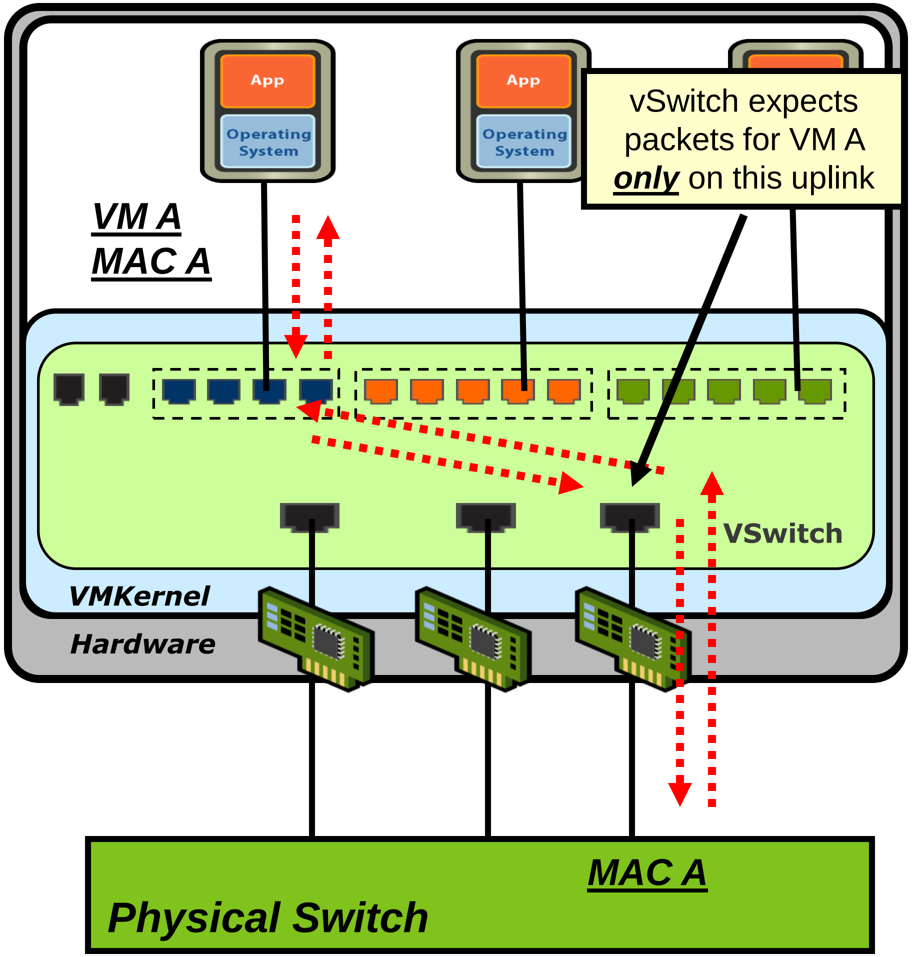
Make sure the NICs in a team are in the same layer 2 broadcast domain

- Check if the physical NIC is connected to the right port/switch

Step 2: NIC Teaming

Port Id or MAC based load balancing on ESX

Don't enable Link Aggregation on the physical switch

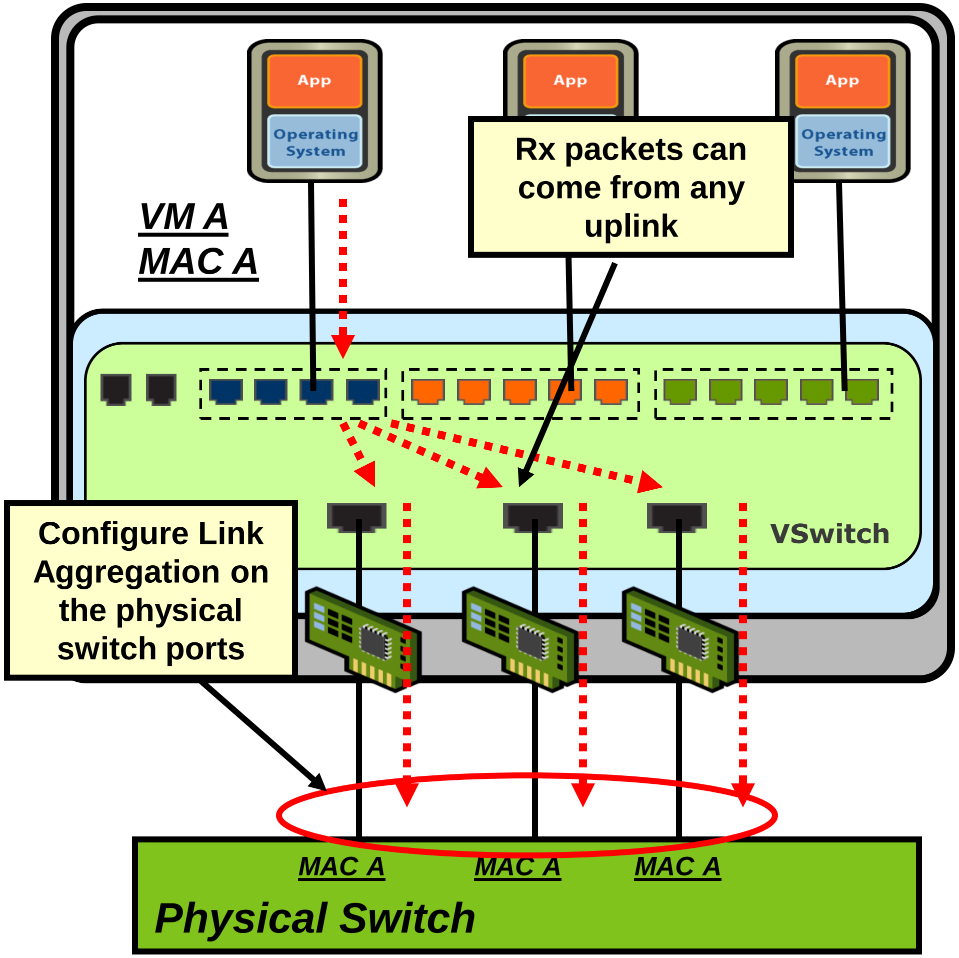


Step 2: NIC Teaming

IP based load balancing on ESX

Enable Link Aggregation on the physical switch

- Static Link Aggregation
  - No LACP or PAgP

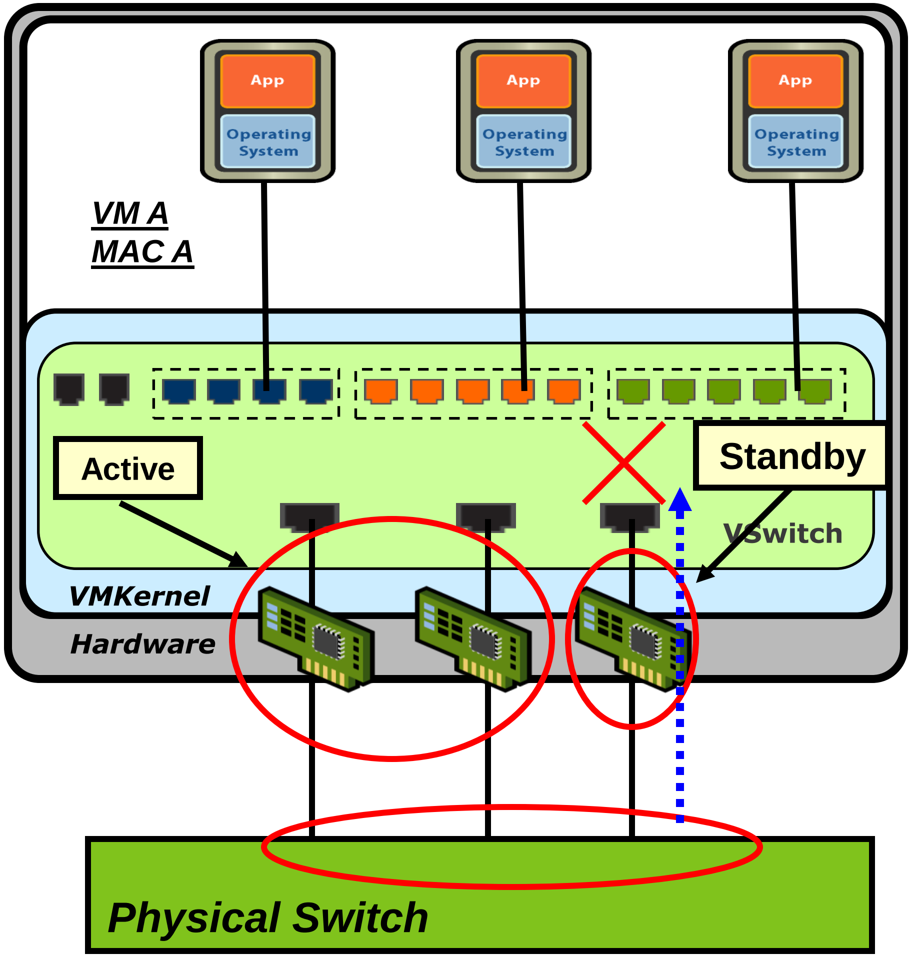


Step 2: NIC Teaming

Active-Standby won't work with IP based load balancing

- Because of the static Link Aggregation the physical switch will want to deliver packets on the standby NIC

Be careful when configuring IP Hash based teaming with other load-balancing configurations on portgroups of the same vSwitch



Step 2: NIC Teaming

Multicast traffic?

↓

Don’t use MAC Address Based Load balancing

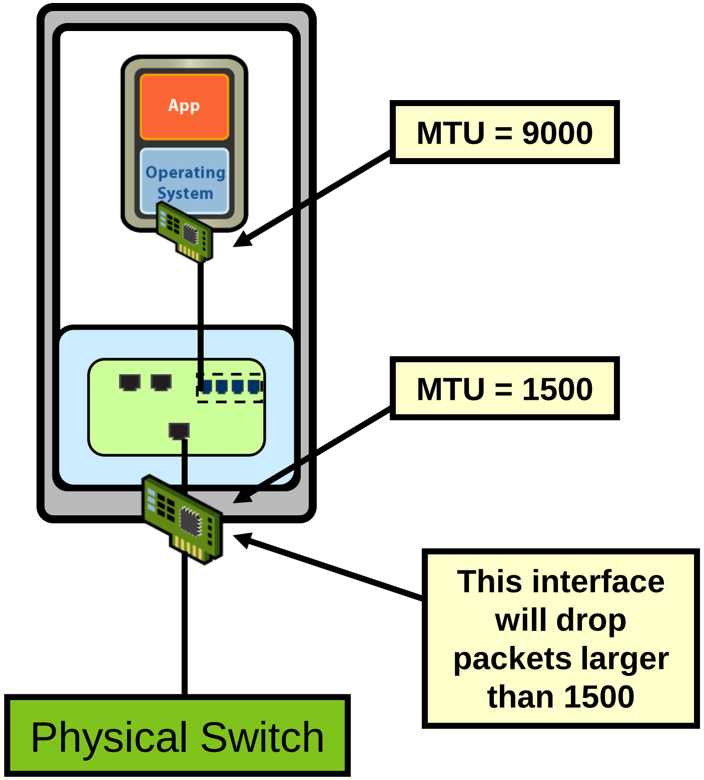
- Use Port Id based load balancing instead

Step 3: Jumbo Frames

Network devices drop frames larger than MTU

How to detect such problems?

- Run ping with large packet size, e.g 20000
  - ping -s <packet size>
- Check for packet drops on the vNICs and the physical NICs



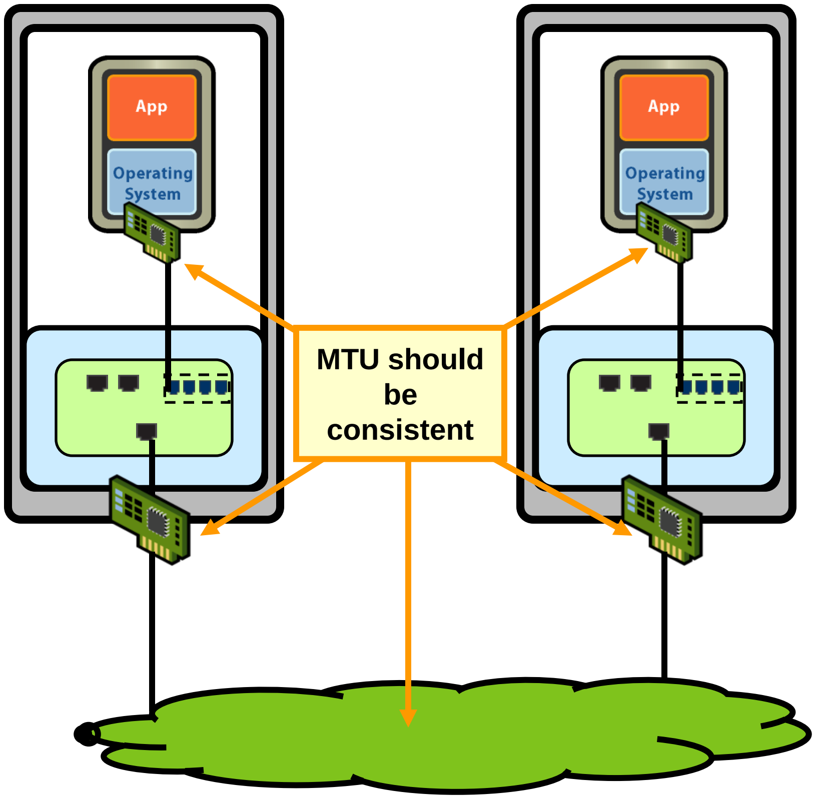
Step 3: Jumbo Frames

MTU should be the same end to end

- Set vNIC MTU in the guest
- Use esxcfg-vswitch to set the MTU of the physical NIC

esxcfg-vswitch –m <MTU> <vSwitch>

  - Use RCLI for ESXi 3.5



Problem

VMs lose network connectivity upon teaming failover/failback

Step 1: Round up the Usual Suspects

Check physical switch side VLAN configurations

- Should be identical for all the NICs in a team

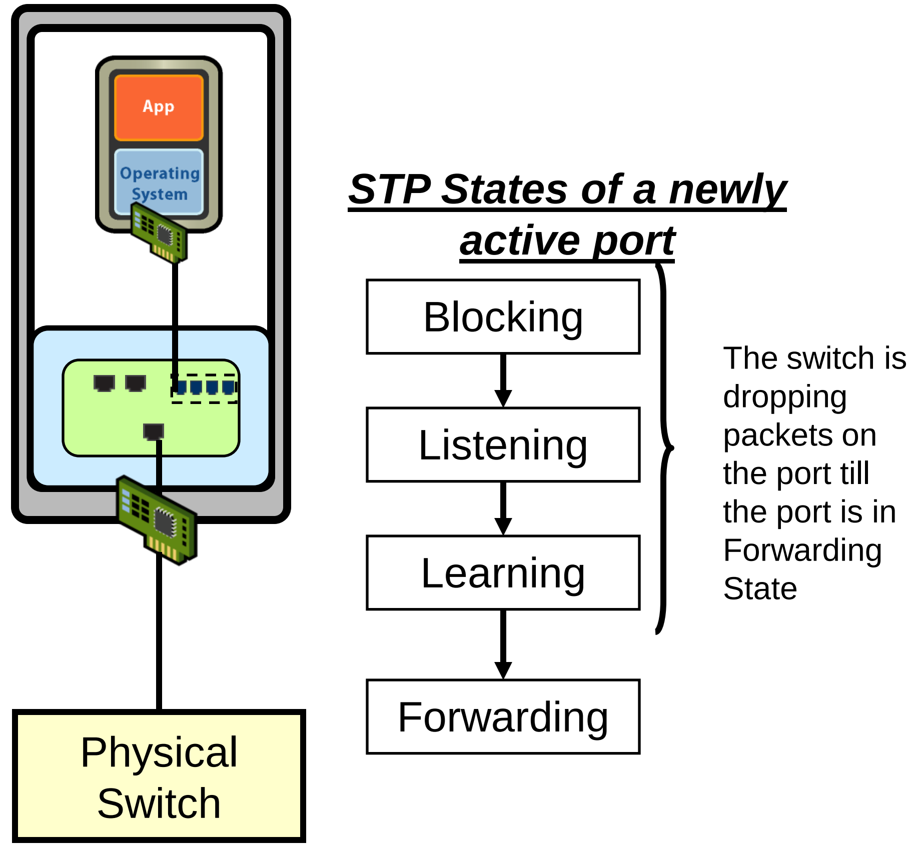
Check physical NIC connections

- NICs in a team must be in the same broadcast domain

Step 2: Spanning Tree Protocol

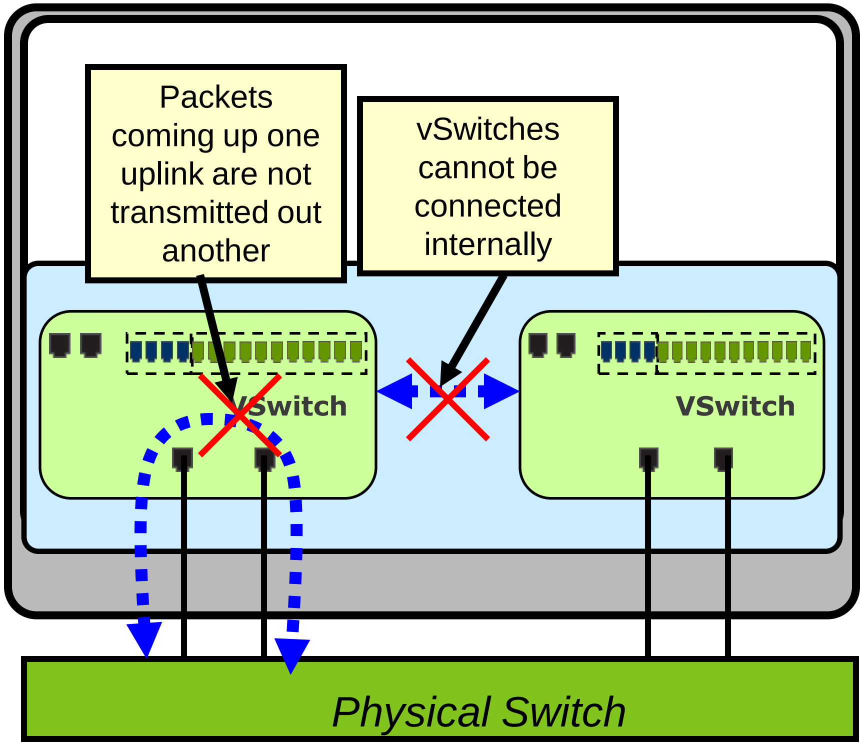
The switch drops packets on a newly active port till the port is in forwarding state, if STP is enabled

This interferes with failbacks



Step 2: Spanning Tree Protocol

Loops are not possible inside ESX



Step 2: Spanning Tree Protocol

To avoid the dropped packets, do one of the following

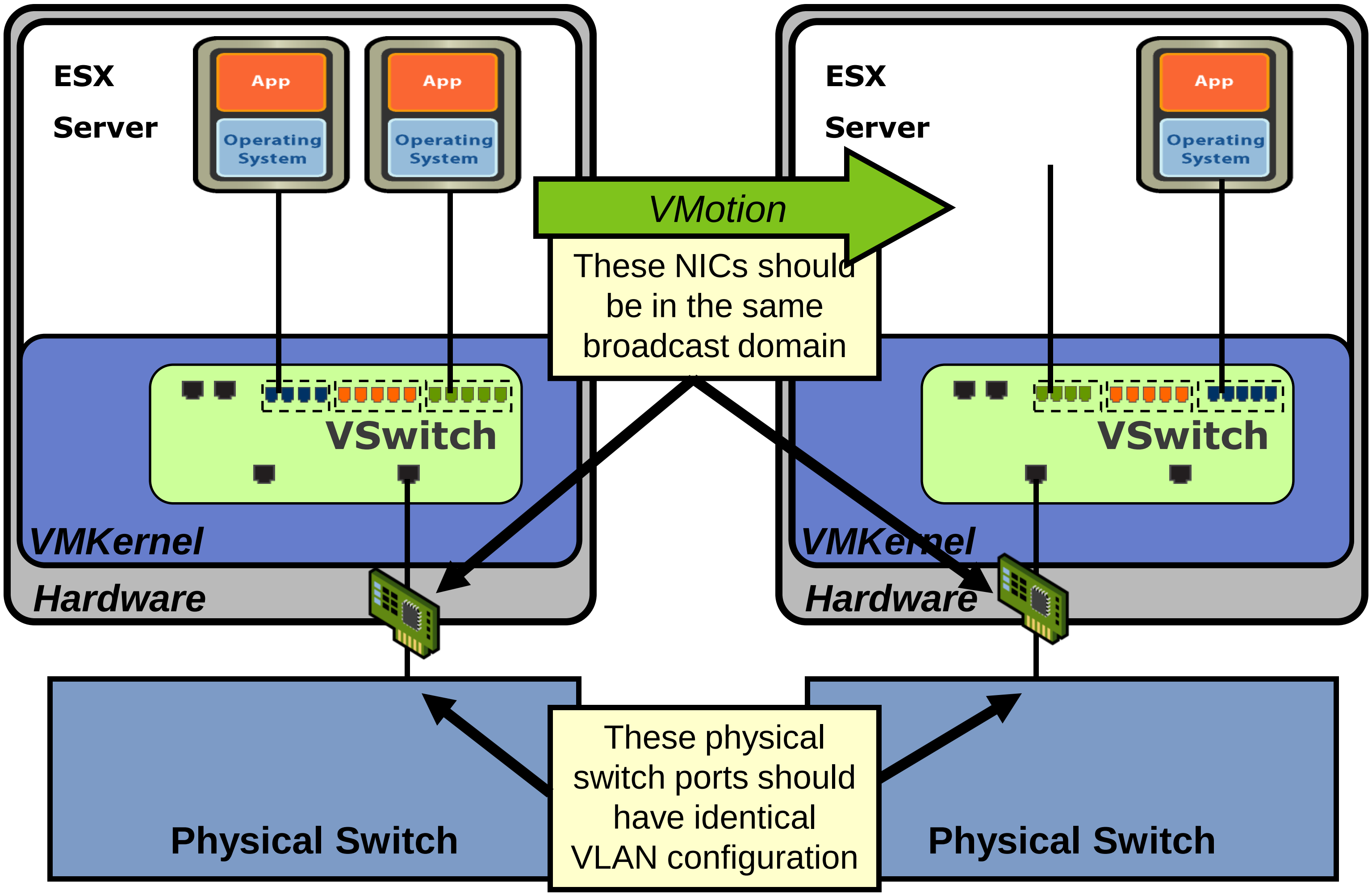
- Enable PortFast mode for the physical switch ports feeding the ESX Server
- Configure the physical switch ports feeding the ESX Server as Edge Ports when using Rapid Spanning Tree Protocol
- Disable STP for the physical switch ports feeding the ESX Server

This is not a recommendation to disable STP in the entire network

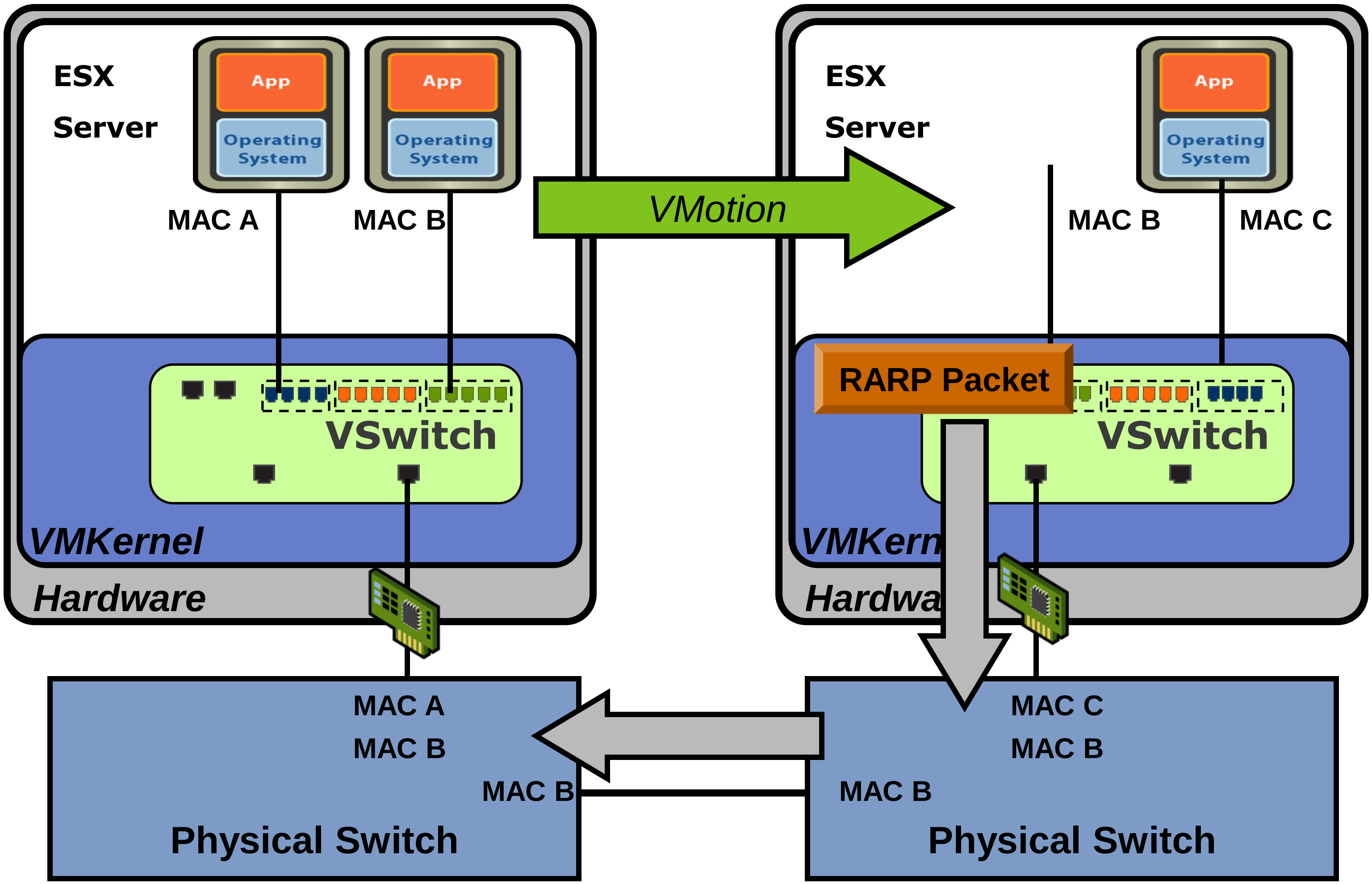
Problem

VMs lose network connectivity after VMotion

Step 1: Basics



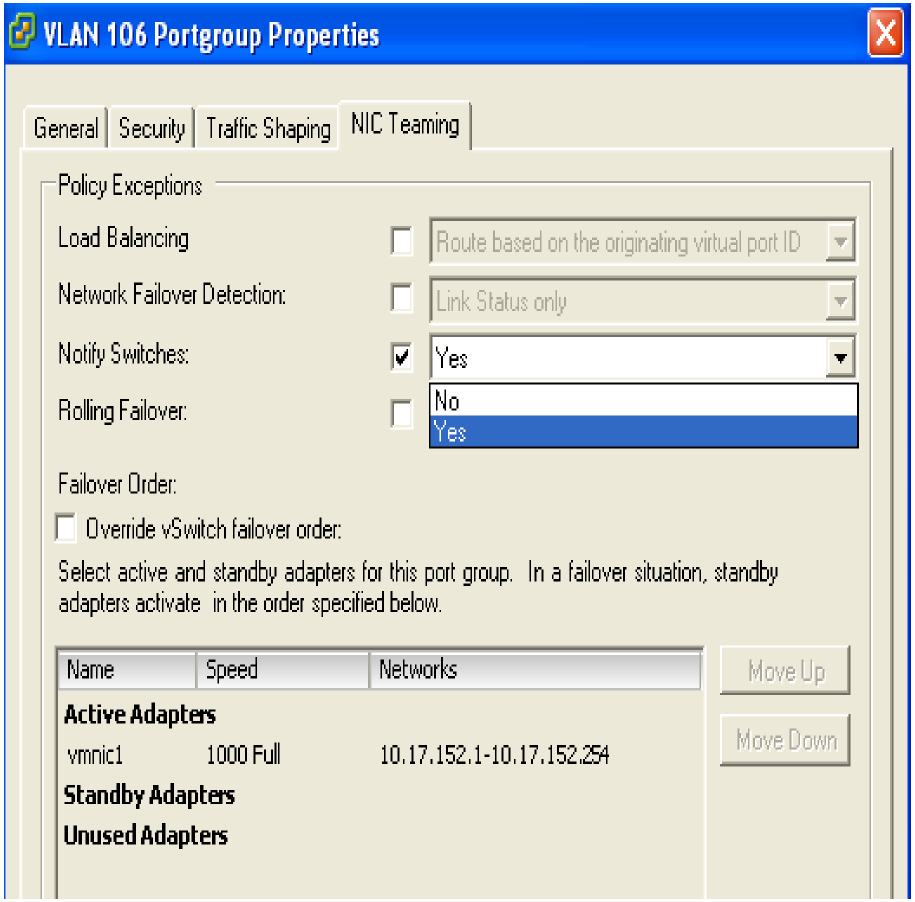
Step 2: Notify Switch



Notify Switch

Notify switch is enabled by default

Settings should reflect application requirements



Problem

Network connectivity is fine on the VMs but my application does not work

Step 1: Check Portgroup Security Policies

Promiscuous Mode

- If allowed, guest receives all frames on the vSwitch
- Some applications need promiscuous mode
  - Network sniffers
  - Intrusion detection systems

MAC Address Change

- If allowed, guest can change its MAC address
  - Implication: Malicious guests can spoof MAC addresses

Forged Transmits

- If allowed, guest can send packets with different source MAC
  - Implication: Malicious guests can spoof MAC addresses or cause MAC Flooding

Security settings should reflect application requirements

Example: Microsoft Network Load Balancing In Unicast Mode

All cluster hosts are assigned the same MAC address

- Thus incoming packets are received by all cluster hosts

Uses forged MAC addresses to hide the cluster MAC address from the switch

- Prevents the switch from learning the cluster's actual MAC address
- Incoming packets for the cluster are delivered to all switch ports

Portgroup configurations

- Allow MAC address changes
- Allow Forged Transmits
- Do not Notify Switch

KB Article 1556

- http://kb.vmware.com/kb/1556

Recommendation: Use NLB in Multicast Mode

For more information:

VMware Networking Technology
[vmware.com/go/networking]

VMware Networking Blog
[blogs.vmware.com/networking]